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POINTS FOR PRODUCERS.

Stock Diseases.

In order to prevent any confusion in the minds of stock owners as to their responsibility under the provisions of the Stock Diseases Act, attention is drawn to the following diseases which have been proclaimed as notifiable:—Actinomycosis, anthrax, cancer, catarrh, dourine (or equine syphilis), equine fever, epizootic lymphangitis, farcy, foot and mouth disease, glanders, lice, pants (or contagious penumonia affecting swine), pleuro-pneumonia, rabies, rinderpest, scab, sheep pox, surra, swine fever, tick fever, trichinosis, tuberculosis. All suspected cases of any of the above diseases should be immediately reported to the Chief Inspector of Stock, Adelaide. Request for advice on stock complaints, not suspected of being contagious, and other veterinary advice through the medium of the *Journal of Agriculture*, should be addressed to the *"Editor."* This course is advised as letters or telegrams addressed to the Government Veterinary Lecturer, either by name or title, may be left unattended for several days whilst that officer is away in the country.

Agricultural Bureau Fixtures.

The Annual Conference of Branches of the Agricultural Bureau situated in the areas served by the Pinnaroo and Brown's Well railway lines is to be held at Tailem Bend on Thursday, August 31st. Sessions will be held at 3.30 in the afternoon and 7.30 in the evening, addresses being delivered by officers of the Department, and papers read by members of the different Branches.

Congress.

The Annual Congress (which was abandoned last year) is to take place in Adelaide on the 4th, 5th, and 6th September, and a large number of questions of vital interest to agriculturists is included in the agenda.

Imports and Exports of Plants, Fruits, &c.

During the month of June, 1916, 943bush. of fresh fruits, 15,326bush. of bananas, 26,695 bags potatoes, 1,480 bags of onions, and 196 packages of plants, seeds, and bulbs were examined and admitted at Adelaide and Port Adelaide under the "Vine, Fruit, and Vegetable Protection Acts of 1885 and 1910"; 303bush. of

bananas (over ripe) were destroyed. Under the Federal Quarantine Act, 827 packages of plants, seeds, and bulbs were examined and admitted from oversea sources. Under the Federal Commerce Act, 356 cases of fresh fruits, 2,270 packages of dried fruits, and 7 packages of plants were exported to oversea markets. These were consigned as follows:—For London—17 cases citrus fruit; New Zealand —39 cases citrus fruit, 2,270 packages of dried fruit, and 7 packages of plants.

Sarcosporidiosis.

A disease of somewhat frequent occurrence in certain parts of the State, and one that has caused sheepowners a good deal of trouble, and, in cases, loss, is described by the Government Veterinary Lecturer (Mr. F. E. Place, B.V.Sc., M.R.C.V.S.) as sarcosporidiosis. In a particular case brought under notice by a correspondent, the animals affected were six-tooth ewes, heavy in lamb, fat, but not too fat. They stood about alone, appeared stiff, and lost the use of the hind legs; got down, were unable to rise or stand when lifted, and subsequently died. "The symptoms, so well described, point to the disease known as sarcosporidiosis," said Mr. Place, in replying. "It is due to a microscopic parasite in the blood cells, which exists, apart from sheep, on the lower leaves of herbage such as grass or dandelion in damp condition. It affects animals that are beginning to thrive as described above, and the preventive is to constantly change pasturage every few days, keeping them off any one for a week if possible. Bleeding at the eye vein is useful, and if they are being fed, half an ounce of sulphur per sheep in the feed would do good. For those affected try 10 drops tr. nux vomica three times a day. Ewes carrying twin lambs are very frequently affected."

INQUIRY DEPARTMENT.

Any questions relating to methods of agriculture, horticulture, viticulture, dairying, &c., diseases of stock and poultry, insect and fungoid pests, the export of produce, and similar subjects, will be referred to the Government experts, and replies will be published in these pages for the benefit of producers generally. The name and address of the inquirer must accompany each question. Inquiries received from the question-boxes established by Branches of the Agricultural Bureau will be similarly dealt with. All correspondence should be addressed to "The Editor, *The Journal of Agriculture*, Adelaide."

VETERINARY INQUIRIES.

[Replies supplied by Mr. F. E. PLACE, B.V.Sc., M.R.C.V.S., Veterinary Lecturer.]

"J. A. C.," Kadina, reports a cow with hard, horny substance on top of ribs near loin.

Reply—This is not likely to hurt the milk, being probably of a warty nature, and would be better removed a week or two after calving. If it has a root tie a strand of horsehair tightly round it, and when it has fallen off dry it up with a little alum applied daily. If there is no root it would be better to have it cut off, in which case it would bleed somewhat, and should be seared with a red hot iron.

"W. A. T.," Cummins, seeks information *re* crossing and mating sows, and also in regard to providing cows in milk with bonemeal.

Reply—A sow pure bred, if mated to a pure-bred boar, then has litter by cross-bred, is then returned to pure bred, will in all probability throw purebred pigs, but may show cross marks in some. Yorkshire sow has festers on ears, the oats are probably too heating, and it would be well to give her a course of green feed, also a teaspoon of sulphur and a handful of charcoal in feed twice a day for a week or ten days. She would be better if having charcoal or cinders regularly. Some people put the sow on the eighth day after farrowing, but the writer believes it is more profitable to mate her between the fourth and eighth day after weaning, she is a better mother in the latter case. In districts where dry bible is prevalent it is well to have a lick handy for cows to get at, consisting of four parts bonemeal and one part saltpetre. If not given as a lick a handful may be scattered over the feed once a day. In some parts of New Zealand this is a regular custom.

"A. J. D.," Willaston, had a foal with thick navel, not parted, tied and cut.

Reply—The probability is that by this time the cord will have shrivelled up all right; if not paint it with tincture iodine once or twice. On a future occasion do this at once when cut, and do not cut more than 4in. to 5in. long.

"S. E. P.," Pinnaroo, had a gelding, nine years, poor and weak, seemed better in light work.

Reply—The probability is stomach worms, such as bots, &c. The veterinary lecturer was at Pinnaroo on the 12th inst., and would have been glad to have seen the animal; it is an advantage to be a member of the Agricultural Bureau, and so have notice of such visits. Keep the horse overnight without food, then give a pint of warm milk in which half a teacup of oxgall is dissolved, follow this an hour later with a pint of raw linseed oil and two tablespoons of turpentine. Then give twice daily in food a tablespoon of the following powder:—Sulphate of iron, sulphur, black antimony, gentian, of each ½lb., linseed meal and brown sugar of each 1lb. Kindly report progress at the end of three weeks.

"G. A. A.," Wilkawatt, asks treatment for pigs which are lousy.

Reply—The question has been answered many times in these columns. The treatment you have given is all right, but you might find a good sheep dip used as a spray more effective. Afterwards keep the pigs well oiled with any cheap bland oil. It is no good treating the pigs unless the sties are also sprayed with disinfec-

tant such as sheep dip, as the vermin harbor in crevices. Speaking generally, in the mallee it would be better to evacuate them and put up fresh ones at a distance. Affected pigs require treatment about once a fortnight until free.

"B. Bros," Winninowie, have a gelding, 19 years, eats fairly well, but loses condition.

Reply—Examine teeth, especially the last back ones, and report condition. Give a tablespoon of the following powder twice a day in feed for a fortnight:—½lb. each sulphate of iron, sulphur, saltpetre, ground fennel seed, 1lb. each sugar and linseed meal.

"S.," Coorabie, has a colt, four years, with thick stinking yellow discharge of nostril, otherwise in good health.

Reply—This appears to be probably a case of ozæna arising from an abscess in the dental sinus following dentition. Give a dose or two of snuff to dislodge matter, steam with a teaspoonful of eucalyptus oil, and syringe with Condy's crystals solution of pink color, about as much as will lie on a 3d. bit to half a gallon of water. It is quite probable that this will not cure, but a report after three weeks' treatment will be esteemed, and further treatment suggested.

"J. M.," Canowie Belt, has horses with scurfy legs, raw and cracking.

Reply—The trouble is chorioptic mange, as in the previous cases, and will yield to the same treatment—benzine and oil with sulphur internally. In bad cracking it may be well to use, in addition, a lotion made of ½oz. each of sugar of lead and sulphate of zinc in half a pint of water with half a pint of methylated spirit added.

"W. A. S.," Geranium, has a cow 10 years, down, unable to rise; seven hours before calving jumped fence; dung and water passed while down.

Reply—The symptoms, especially the extension of the hind legs, point to injury of the spine, and the passing of dung and water rather put milk fever out of court, so that it is probable nothing would have saved her, as the injury was most likely fracture of a vertebra. In addition to the one-third milk and water and pollard give the calf a handful of linseed jelly, made by boiling linseed or linseed meal till it has taken up all the water used. A little rice is useful if the calf should scour.

"W. S.," Verran, had a gelding, nine years, taken ill about 4 p.m. in plough, very severe pain, and died; breathing very labored at end.

Reply—The most probable cause of death was rupture of the diaphragm, due to working heavily on a full stomach, retention of urine is a symptom of this condition. The soda and ginger would have done more good than the saltpetre, but the dose given, about an ounce, though large, would not do harm. Nothing would have saved the animal.

"C. O. R.," Julia, has bay mare two years, with lumps on shoulder after feeding 6lbs. oats.

Reply—Six lbs. oats a day is not too much by any means, but combined with grainy chaff may supply too much nourishment, and the lymphatics of the skin may have to try and get rid of such by breaking out into little lumps as described. A flat tablespoon of sulphur once a day in feed for a week will probably put matters right. For various substitutional rations see the very excellent tables published in last year's *Journal of Agriculture* by the Director of Agriculture, and available in leaflet form.

"S. C. B.," Crystal Brook, had a stallion, 11 years, which after hard day's work refused feed, colic pains ensued, three hours later sat up at intervals like a cat, shoulders twitching, next morning fell over, then walked round for two minutes, fell over and died.

Reply—The symptoms well described; all point to rupture of the stomach, which is frequent in horses of the above description, and generally results from abscesses brought about by the worm *habronema equi*. No treatment would have been of any avail.

"P. A. W." Wirrabara, seeks information *re* feeding a stallion.

Reply—A reference to last year's replies will give rations, also the excellent rations suggested by the Director of Agriculture in the same *Journal*. Linseed is not desirable for a stallion in service, and 5lbs. of boiled barley daily will have a better effect both on coat and vigor.

"C. W.," Whitwarta, has a mare with hollow inside wall of hoof filled with dry black powder; has been opened and now no lameness.

Reply—The condition is due to an old standing injury, and the treatment has been correct so far, but it will be as well to stuff the opening with beeswax, or better, plasticine, and blister the lump at top of hoof. Keep the wall dressed with Stockholm tar, and kindly report progress after a month.

"W. N. B.," Tintinara, states that cow in calf five months, just dried off, paddock and feed, went off feed, lost cud, frothed at mouth, nose dry, twitching at flanks like poisoned dog, swaying, and labored breathing.

Reply—The symptoms certainly point to poisoning, and although up to the present there is no evidence of cattle being affected like horses with "cress," yet that weed produces such symptoms. The bones of poisoned foxes also have been credited with retaining toxic properties, and the symptoms would simulate those of phosphoric acid poisoning also, but if there were fresh strychnine baits the cow could get at, they would be a more likely cause.

"H. H. R.," Edillilie, states that a gelding, four years, was affected with colic, improved after course of arsenic, fell away again, and urine became thick and dark.

Reply—The trouble, as you suggest, is bloodworms, and the parasites not infrequently occupy the blood vessels of the kidneys, producing the symptoms you name. It would be well to give another course of the Fowler's solution of arsenic, and follow it with a tablespoon daily of a powder made of sulphate of iron, sulphur, saltpetre, thymol, of each ¾lb., sugar, linseed meal, of each 1lb.

"J. G.," Clare, reports that a mare, four years, had high fever, died; spleen enlarged as a yellow-greenish mass.

Reply—The cause of death was a splenic abscess, which is most frequently brought about by invasion of the minute worm known as *Habronema equi*. Treatment in such a case would have been of no avail. The condition is not infectious in the general sense of the word, but all such conditions are better treated with caution, and parts buried in lime or burnt. The functions of the spleen are still more or less of a mystery to physiologists, but it is known to be a repairer of blood cells, and a regulator of blood supply during digestion; it is sometimes called the digestive heart.

"M. S.," Bute, reports a mare, 14 years, stiff in front quarters, worse off, muscles shake and quiver.

Reply—The symptoms seem to point to congestion of the laminæ of the feet, and it would be well to dress the hoofs every day with Stockholm tar and to give 10 drops of tincture aconite on the tongue morning and evening for 10 days. A report at the end of the time will be esteemed.

"J. S.," Hawker, reports (*a*) mare passing stones with dung; (*b*) horse with white speck and matter in eye, blind.

Reply—(*a*) Continue linseed and molasses, which will keep the bowels loose, give 4ozs. of Epsom salts in feed for three evenings, then stop a week and repeat; also give morning and evening on the tongue 10 drops tincture nux vomica. As long as the stones pass they will do no harm, but if they lodge in the bend of the bowel then they will set up serious mischief. (*b*) The eye has been injured by a prickle or bit of chaff, but as it is improving the following treatment will be all that is necessary:—Blow in a small pinch of boracic acid once or twice a week. If the lens is injured the blindness will be permanent, but if it is only on the corner, then it will gradually go off.

"E. M.," Meribah, reports (*a*) horse gone over on hind legs; and (*b*) filly with lump on side of hock.

Reply—(*a*) It is to be feared that nothing but a very doubtful surgical operation will do any good, and in an old animal it is not worth while going to such expense, so beyond rubbing in a stimulating liniment, such as the one in the "Medicine Shelf" daily; nothing much can be done. (*b*) The lump is probably a thoroughpin, and it would be well to blister it with biniodide of mercury 1 drachm, lard 7 drachms, using a quarter of the quantity every three weeks.

"G. J. P.," Butler, states that a cow went off feed and dry in three days; no pain, stiff in getting up, died in three weeks.

Reply—The symptoms and the p.m. all point to inflammation of the pleura, of which the cow died. The heart was involved secondarily. The water and the rotten fat were the products of inflammatory action, although it would seem to a layman that there was none. Probably no treatment would have done any good.

"S. Bros.," Murat Bay, have a mare, 14 years, moping, and off feed and grinds teeth, continually losing small quantities of water.

Reply—It is very difficult to say what is the matter without seeing the mare, but it would seem that she has an internal growth, tumor or abscess, and she is not likely to mend so as to be profitable; give her a ball once a day containing the following:—Aloes 1 drachm, resin 1 drachm, saltpetre 1 drachm, soft soap ½oz., continue for six days, and if there is improvement report again, when a change of treatment will be suggested.

"E. G. J.," Port Adelaide, has pony mare, four years; teething and poor appetite.

Reply—Glad to hear that the treatment has done good, and it is now time to change it. Give a tablespoon of syrup of phosphate of iron twice a day, she will probably lick it off a spoon; if not mix with a little molasses and put on the tongue or in feed. Twice a week give a tablespoon of sulphur in feed. She will soon begin to pick up, and a later report will be esteemed.

"E. C.," Parilla, seeks information in regard to treatment of parasites in stock.

Reply—Most of the information desired will be found in a paper by myself on "Common Parasites," read before the Congress in Adelaide, in 1912, and printed in the *Journal of Agriculture*. Gid in sheep is caused by the *Coenurus cerebralis*, the cystic form of *Taenia coenurus* of the dog, who passes the mature segments and the ova are picked up by sheep, the shells dissolved by the gastic juice, and the embryos set free, some lodge in the skull, and in eight to 20 days the symptoms develop. Sheep feeble with brain symptoms, blind, circling, &c. Treatment—Find soft spot on skull, trephine. Prevention—Do not let dogs, foxes, &c., devour affected sheep. Dogs and like animals are the chief disseminators of many kinds of worms, especially those affecting sheep, cattle, pigs, and human beings, and should be kept off raw offal as far as possible and dosed every quarter for worms, as often advised in these replies. In-breeding in pigs—This has been dealt with in other recent replies. In-breeding judiciously is necessary in building up a herd, but in-breeding mongrels will accentuate their bad points.

"M. E. M.," Hornsdale, has a blood mare with staked off foreleg, between knee and fetlock, abscess rose and was lanced, mare very lame, lump hard and tender, after a ride of 204 miles lump broke and blood oozed.

Reply—The covering of the bone has been injured by the stake periostitis, and possibly there is a splinter still in. It would be advisable to blister with biniodide of mercury 1 drachm, lard 7 drachms, and spell for a month after, when a further report would be esteemed.

"W. N. B.," Tintinara, reports that ewes go sleepy, lose condition. P.M.—Liver yellowish and lumpy, the lumps being white and hard. The belly and heart bag full of water, heart flabby.

Reply—The condition of the liver points to fluke, or bladder worm, *Cysticercus tenuicollis*, the watery condition of the belly and chest to *Sarcosporidiosis*. The heart is always hollow, but should be hard muscle, not flabby. The parasites are spread by dogs and vermin. Treatment—Change pasture every few days, do not allow sheep to bite tight, hand feed with a little chaff, give Cooper's worm tablets (Elder, Smith) to the affected ones; do not let dogs or foxes get at offal.

"E. L. P.," Mindarie, seeks cause of white hairs, due to collar or saddle pressure, and information *re* broken wind.

Reply—(*a*) The whiteness of the hair is due to destruction of the pigment cells at the root of the hair by pressure, and may be avoided by leaving saddle or collar on loosely till dry and then well hand rubbing the part and dressing after with methylated spirit. Once formed, dyeing is the only way of doing away with the whiteness, which, however, is no harm. (*b*) It is extremely unlikely that the colt is

broken-winded—*Emphysematous*—as such a condition is mostly associated with hard work. But he may have any of the dozen and one complaints of the lungs and air passages which would cause a difficulty in breathing. The method of detection would vary with the disease, so cannot be detailed.

"W. Bros.," Yeelanna, report that a cow has fallen off in milk, dull, lazy; does not care for bonemeal.

Reply—The symptoms point to indigestion. Try her with 1lb. of Epsom salts in a quart of warm beer with an ounce of sulphur and half an ounce of ginger added. Follow this by 10 drops tincture nux vomica morning and evening for 10 days, and kindly report progress, quoting 1964.

"W. Bros.," Yeelanna, have foal, mopey, hanging head, sheath swollen; sand shifted with milk and honey, and two white worms by powder.

Reply—Thanks for putting inquiries on separate sheets, it much facilitates reference and filing. The foal has both long worms (*Ascarides*) and bloodworms (*Solerostoma*). He would probably benefit by getting a tablespoon of Fowler's solution of arsenic once daily for a fortnight, stop a fortnight, and repeat for another. Do not castrate him for several months after apparent recovery or he will probably die. A later report will be esteemed.

"J. F. C.," Edillilie, has a gelding, 18 months, which passed bloodworms after treatment for sand, then penis swelled.

Reply—The swelling of the penis is due to the toxins produced by the bloodworms, and he will do well on a tablespoon of Fowler's solution of arsenic, obtainable at the Port Lincoln chemist's, given once a day in a little bran. Give for a fortnight, stop for a fortnight, and repeat another fortnight. Local treatment of the penis may be necessary. First sling, by sewing a bran bag over loins; scarify if as big as a man's thigh, dress in any case with camphorated oil, camphor 1, olive oil 8 parts. A later progress report will be esteemed.

"R. J. R.," Edillilie, has gelding eight years, drenched with oil, turpentine, and kerosine, left off eating, died; lungs full of froth, and sand in bowel.

Reply—Was like many others, killed by kindness. The drench went the wrong way, and set up broncho-pneumonia, which was worse than worms and sand. The worms would have quitted naturally on green feed, which was why you began to see them, and the sand might have been shifted with milk and honey as so often prescribed, and no pneumonia followed, even if it had gone into the lungs. Never continue to drench a horse that coughs and never keep the head up high.

"A. S.," Naracoorte, reports cow with possible dislocation of the stifle.

Reply—If the patella is really displaced the leg will stick out behind, and she will not be able to bring it forward, if there is only a lameness and clicking noise, it is rheumatic arthritis. In the former case put a loop of rope round the neck and pass the line round the affected leg fetlock, and draw the leg up till the foot is near the elbow, then try to replace the patella by pushing it upwards and inwards till it goes into place with a click, leave the leg roped up for an hour or so, and apply a blister composed of 1 drachm biniodide of mercury and 7 drachms lard. In the second case apply the blister only over the joint, rubbing it well in for 10 minutes.

RUST OF WHEAT.

[The first of a series of three University Extension Lectures, dealing with Plants and Disease, delivered by Professor T. G. B. Osborn, M.Sc. (Manch).]

I feel some apology necessary for venturing to lecture in such a time as this, when all thoughts are turned to war and bloodshed, upon so peaceful a subject as plants. Yet the ultimate foundation of our civilisation has rested upon the progress that the human race has made from a condition of nomadic hunters, using such vegetable food as chance provided, to a race living in a settled abode, and growing the food necessary for its support. In the words of the motto used by a famous Agricultural Department, "Agriculture is the foundation of industry and commerce," and it is to these we turn, in the hope of restoring the devastation of the present struggle. In a sense, too, my subject deals with a war, one of age-long continuance, but one that the increase of our knowledge has rendered decreasingly harmful, and not increasingly frightful.

Early References to Rust Disease.

Probably, so soon as man began to grow crops, he became aware of the fact that there were times and seasons when his efforts at cultivation were brought to nought by some unaccountable agency. What more natural than that he should attribute the mystery to some wrathful God? So we find that the writers of the Book of Deuteronomy class "blasting and mildew" among the punishments inflicted upon a disobedient people by the offended Deity. It is my object, in this course of lectures, to place before you a few of the aspects of one of the newest of sciences—that of phytopathology—the study of plant diseases. By way of introduction, we shall, in this first lecture, consider one of the most widespread of plant maladies—rust of wheat.

Just as many human diseases are caused by germs invading the system, so we find that most plant diseases are caused in a similar way. Most of these germs causing disease amongst animals and plants are themselves plants, which live at the expense of the individual they attack, and are therefore known as parasites. The simplest of these parasites are bacteria, which cause diseases such as typhoid, diphtheria, and pneumonia in man, and wet rot of potatoes in plants. Fungi are a class of more highly organised parasites. They do not usually attack

animals, though thrush and ringworm are due to fungi. However, fungi are responsible for a very large proportion of plant diseases. The fungus causing rust of wheat has been deliberately chosen as a type for this lecture, since few parasitic fungi are better known, and no group of organisms has proved of more importance to the biologist than these, because his study of them has disclosed so much concerning parasitism in general. The history of this disease goes back to remote antiquity. Whatever may have been the nature of the pestilence, "blasting and mildew" of crops referred to by Solomon in his prayer at the dedication of the temple, about B.C. 950, there is little doubt that the *erysybe* of the Greek authors was identical with our wheat rust. One of the earliest accounts given is that by Theophrastus, B.C. 300, who notes that *erysybe* was most prevalent in hollow places protected from the wind. If his observations upon the position of an outbreak in a crop were accurate, his attempted explanations were less happy. Rust to him was a kind of putrefaction, induced largely by the heat of the sun acting upon leaves still damp with rain. This view was prevalent in the time of Pliny, A.D. 30, who held, however, that frost caused the trouble. Ovid gives us an account of the annual Roman ceremony of the Rubigalia, when sacrifices of incense, the entrails of a sheep and a red dog were offered to the rust god. However fascinating the account of such a sacrifice may be to a student of antiquities or comparative religions, no one to-day would place any reliance on such a method of combating the disease. It was not until the 18th century that a fungus organism was discovered on rusty wheat. This is not to be wondered at, for without the aid of a microscope the fungus cannot be seen, and the microscope was not used in the study of plants at all until late in the 17th century. Even after the microscope came into use, and the fungus had been seen on rusted wheat, its relation to the disease was not clearly understood; for botanists had but the vaguest ideas of what fungi were, classing them with those organisms that—"Without parent, by spontaneous birth, Rise the first specks of animated earth." It is, in fact, but little more than 50 years since the full life-story of the rust fungus was first discovered by the great botanist de Bary, who, for many reasons, may be counted as the founder of the serious study of fungus diseases of plants.

Description of the Fungus.

Almost at any time during the wheat-growing season there may be observed, as the result of careful search, yellowish patches upon the fresh green of the leaves. Sometimes they become very abundant, extending as the season advances even to the stem and ears. These patches, at first small, become larger and more numerous, while there

is formed from them a fine powder. This is seen to consist of innumerable yellow-red granules, or spores, called the uredospores, from a Greek word, "to burn or shrivel up." If a section be made through a wheat leaf, it is seen that between the cells of the leaf there are numbers of fine, colorless threads—the fungus. These fungus threads (*hyphae*) live at the expense of the green cells of the leaf, from which they steal the food substances manufactured by them. Eventually increasing in number, they become clustered below the leaf skin. There the ends of the *hyphae* swell, and ultimately bud off the ovoid uredospore. The accumulation of countless threads budding off spores eventually causes

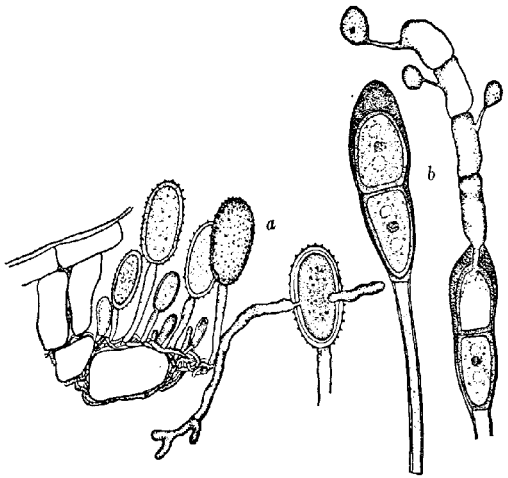

FIG. 1.—*Puccinia graminis*. *a*. Cluster of uredospores emerging from wheat leaf. A single spore is shown on a larger scale with two germ tubes. *b*. Two teleutospores; the one to the right has germinated and is forming the small spores that produce infection of the barberry leaf. All highly magnified. (From "Fungus Diseases of Plants," by B. M. Duggar, Pub. Ginn & Co.).

the leaf skin to burst, and the spores are set free. Each spore consists of a little cell, about one-thousandth of an inch long, with a rather thick spiny wall, which, however, has three or four thin spots in a band across the middle. You may think of the spore as an infectious germ, or, if you will, as the fungus seed.

When these uredospores are taken fresh from wheat, and placed in a drop of water, they begin to sprout, by sending out one or more thin tubes at the spots mentioned. These are the germ tubes, one of which

outstrips the others in length, and in a few hours develops a delicate branched thread, some 10 or 12 times the length of the spore. If it remains in water it soon dies, for it has no great amount of food on which to draw. If, however, this development has taken place upon the surface of a wheat leaf, the tip of the germ tube finds its way to one of the breathing pores that occur plentifully in the leaf skin. Here the germ tube swells a little above the two cells, guarding the pore or stoma, and then continues its growth through the pore into the tissues of the leaf. There it rapidly grows, branches freely, and absorbs the food from the leaf by means of little suckers that it pushes into the cells, thus forming a new centre of infection. The countless thousands of uredospores formed may all infect leaves, provided there be sufficient moisture, in the form of rain or dew, for them to germinate in. Thus it will be seen that there may be times when the fungus rapidly increases in amount, as a result of certain weather conditions

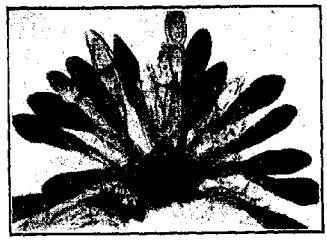

FIG 2.—Microphotograph of a cluster of teleutospores of *P. graminis*, magnified about 260 times. (From "The Rusts of Australia," by D. McAlpine, published by Victorian Department of Agriculture.)

—a point to which we return later. As the season progresses, the flecks of yellowish-red uredospores appear much darker in color—become a blackish brown. If such a patch be examined, it is seen that mingled with the uredospores, or even wholly replacing them, there is a new kind of spore altogether. This is a more elongate structure; it is seen to consist of two cells, having much thicker walls, and each cell having only one inconspicuous germ pore. The spores are so different that at one time they were thought to belong to an entirely different fungus. Now, however, they are known to be a part of the life-story of the rust fungus. Because they occur towards the close of the wheat-growing season, they are known as the teleutospores, or end-spores. Not only do they differ so completely from the uredospores in appearance, but they behave in an entirely different manner.

When taken fresh from the wheat plant, and placed in water, they will not show any signs of germination, nor can they be induced to grow for some months. But in the European spring (I shall consider the special Australian conditions in a moment) they begin to show signs of activity. They do not germinate in the same way as the uredospores, but put out a short tube, which segments into four parts. Each segment puts out a very delicate peg-like branch, which in the course of a few hours swells at its end to form a minute spherical spore. Now, the remarkable thing is this, that neither the teleutospore itself, nor the little spores that it produces on germination, has the least effect upon a wheat plant. All attempts to induce rust by sowing them on wheat leaves or young plants have been quite fruitless. What, then is the use of them?

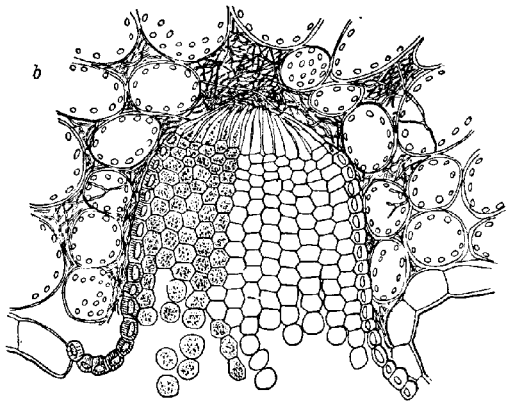

FIG. 3.—Section through cluster-cup stage of *P. graminis* on barberry, showing the chains of spores formed in the fructification. These spores produce infection on the wheat plant. Highly magnified. (*After Ward.*)

ROLE OF THE BARBERRY.

There grows in North Europe a rather ornamental shrub, with prickly leaves and yellow flowers, sometimes the leaves are beautifully reddish. It has been used as a hedge plant, and more often occurs in gardens. It is the barberry. The leaves of the shrub are occasionally found to be deformed, with yellowish, thickened patches. These are caused by a fungus, which lives between the cells of the leaf, the irritation of its presence causing it to become unusually thick. The fungus has hardly a single point of resemblance to that causing wheat

rust. On the lower surface of the leaf there is to be seen a number of cuplike depressions—cluster cups—from which the yellow spores are freed. The spores formed are somewhat like the uredospores on wheat in color and shape, but more spherical; moreover, they are formed in chains in the cup, and not each on its own stalk. For more than 50 years before de Bary's time it had been surmised that the barberry bush had some mysterious connection with wheat rust, but no one knew how. When, in 1854, he announced that teleutospores of wheat rust sown on barberry leaves produced the cluster cup fungus, most people received the statement with scepticism, and some with open derision. The following year he was able to show that spores formed in the cluster cups infected the wheat leaf, producing rust disease. The wheat rust fungus was thus shown to attack two different plants in the course of its life. The early part of its life is spent on the wheat plant, and when the wheat dies down, after a rest it passes on to the barberry, there to complete its life and produce the spores which infect the wheat crop of the next season. Thus the barberry acts as a kind of intermediary, starting the rust fungus in the spring, between one wheat season and the next.

That a parasitic organism should live on two widely different plants in this way was then—in de Bary's time—an unheard of thing. Now, however, the idea is much less strange, and in animal diseases especially people are familiar with it. Malaria is one of the best-known cases in point. The fever is caused in man by a parasitic organism that lives in the red cells of the human blood. There it increases and multiplies, causing fever, and ague, and other symptoms in the victim; but the parasite cannot get out of its victim's blood, and so infect anyone else. When, however, the patient is bitten by the anophiles mosquito, the insect ingests along with the blood the parasitic organism. In the mosquito the malaria germs take on a new shape and method of behavior. Ultimately they form little spores, so minute that they are carried by the mosquito's saliva into another man when the insect takes a fresh meal. The spread of malaria can be prevented by (*a*) preventing the mosquito from biting a patient, and so spreading the disease; or (*b*) a more sure way—exterminating the mosquito. The latter course has been adopted with signal success in places such as the Panama canal zone, where malaria was formerly rampant. The part played by the barberry in spreading rust may be compared with that played by the mosquito. It may be well thought that the control and final elimination of wheat rust would be a simple matter, as the elimination of malaria from an infected spot. Exterminate all barberry bushes, and there is nothing for the spores

formed by the teleutospores to infect. Hence no cluster cups can form, and there are none of their spores to infect the wheat in the spring.

Behavior in Australia.

This had been tried in the previous century, even before the part played by the barberry was fully understood, by the State of Massachusetts, whose Legislature passed a barberry law compelling landowners to destroy all barberry bushes planted on their land. It was unsuccessful in Massachusetts, but in the light of our present knowledge it is being enforced in some parts of Europe now—Germany and Denmark. Competent observers in both countries in the last few years have reported a marked decrease in the amount of rust. In Australia we have no native barberry bushes, and the shrub is by no means common in gardens; yet, as we have discovered only too well in some years, rust is certainly present. Even when the barberry is introduced to regions where rust is prevalent, the fungus seems to have no effect upon it. Attempts have been made by directly sowing the spores on barberry leaves, by surrounding the barberry by rusted wheat plants, and spreading rusted straw amongst them, yet no one as yet has induced cluster cups to form on the barberry leaves. The teleutospore, then, which in Europe causes infection of the barberry, is in Australia useless. It cannot infect the wheat plant, and for some strange reason does not infect the barberry.

Can any other plant act in place of the barberry? Apparently not. Then, can the fungus survive from one wheat season to the next without an intermediary plant? Apparently it can. We are driven to the conclusion that the wheat rust fungus exists from year to year, and spreads by the uredospores alone, which in Europe possibly serve only to cause rapid spread of the disease amongst the wheat crop of one year. One is naturally inclined to ask what, then, is the reason the fungus forms teleutospores at all in Australia, seeing that it can and does live and grow without them? To such a question no certain answer can be given. It seems to be the habit of the fungus to do so—that is all one can say. The necessity for the teleutospore and cluster-cup stage in the life of the wheat rust has been seriously questioned even in those countries where the barberry plant is found native. It has been suggested that the transference of the fungus to the barberry reinvigorates it. Certainly this cannot be necessary in Australia, where, without barberry, the fungus is often observed in far too vigorous a condition. Experiments have recently been made in America to test whether the barberry is vitally necessary, or whether the uredospores can maintain their virulence when produced on successive crops of wheat only. Uredospores were sown on wheat; the

spores produced from that infection were sown on fresh wheat plants, and so on, time after time. After 52 successive infections on wheat had been made, the fungus was found to be as vigorous as ever. There is little evidence, therefore, to show that barberry is necessary, even in those countries where it grows commonly and produces the cluster cups. The question now before us is how the uredospores survive from one wheat season to the next. This has to be solved by each wheat country for itself, because the seasons at which wheat is grown, and the weather conditions in the interval between successive growing seasons are so different. In Europe and the north of the United States of America it resolves itself into seeing if the uredospores can survive the cold of winter. This has several times been asserted for the United States of America, and has recently been abundantly proved, especially for the northern parts, where the uredospores have been kept frozen all the winter, and found to germinate in the spring. Although they can survive continued freezing, it would appear that the alternation of frosts and mild weather causes their death. That is why European observers still dispute the possibility of the uredospore alone being capable of carrying the fungus over the winter.

In the south of the United States of America the conditions are different from the north. The winters are not cold, and vegetation does not cease. The summer months of July, August, and September are very hot and dry. The wheat season is over, and the problem for the fungus is rather how to exist during the dry, hot weather, when no wheat is growing. These conditions are similar to those obtaining in Australia; wheat is growing during most of the winter, after the rains break; the season when there is none growing is during the heat of January, February, and March. We have at present no satisfactory evidence that in Australia the uredospores of one wheat season can live desiccated until the next; rather the reverse. How the fungus survives during our hot summer is one of the many problems that awaits a solution.

Is Rust Present in the Grain?

If, however, the uredospores do not survive, there is the possibility that the spawn of the fungus may be in the grain. Rust is frequently seen on the ears and chaff of badly infected wheat. May it not spread to the grain, and remain in a resting condition there until it is sown, and grow out when the young plant shoots? Such a state of affairs is well known for several fungus diseases, some of which we will consider in succeeding lectures. The example of the hollyhock rust may be mentioned here as a case in point. Hollyhocks are generally found about Adelaide with little dark-brown patches on the stems and backs

of the leaves caused by this fungus. So prevalent is it that I have been gravely assured by a grower that it is the nature of the plant to produce them. These fungus patches may often be found on the familiar disc-like fruits and seeds of the hollyhock, and there is no doubt that the fungus is thus carried to seedlings formed from them. Such patches of rust have been carefully searched for on wheat grains by many observers, but I know of only one account of their occurrence, and that is not very convincing: confirmatory evidence is certainly

FIG. 4.—Photograph of head of wheat, showing development of rust fungus on the chaff.

ceded, for except in this one case, microscopic examination has not own any fungus threads in the grain. Yet often so widespread is the utbreak of rust that some of the most competent observers are con-inced that the rust fungus must be present in the seed sown.

MYCOPLASM.

It was this belief that has led the great Swedish botanist Professor ikkson to advance the remarkable explanation that rust outbreaks re due to what he terms *mycoplasm* in the wheat grain (a compound

word suggesting the ideas of fungus and protoplasm). It being agreed by almost every observer that there is no sign of the very characteristic fungus threads of rust in the seed, Eriksson has suggested that within it the living substance of the fungus leaves its cell walls and mixes with the protoplasm of the wheat. There is thus nothing that the observer with his microscope can detect as the fungus; he simply sees protoplasm living within the cells, but cannot recognise that this protoplasm is a mixture of that of the wheat plant and that of the rust fungus. Eriksson admits that no trace of the fungus can be seen in the seed or its embryo, nor in the young leaves that it produces in its first growth. He claims that it is there as invisible mycoplasm. As mycoplasm the rust organism lives in the seed, as mycoplasm it passes out in to the seedling, so into the leaves of the young plant. Here when the warmer conditions of spring come on, the mycoplasm forms special "corpuscules," in which condition it can first be detected by the methods used in staining sections of plant tissue for microscopical examination. From these

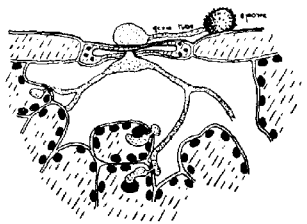

FIG. 5.—Diagram to show infection of wheat leaf by uredospore. The spore is seen on the surface of the leaf to the right. The germ tube grows along the surface and enters by a pore into an air space in the leaf. The development of suckers from the hyphæ passing into the leaf cells is shown.

"corpuscules" the fungus threads reappear, first as the sucker by which the fungus taps the cells of its victim, then as the usual hyphae running in between the cells of the wheat leaf. By this means it will be seen that, according to Eriksson, the first reappearance of rust in the spring is due, not to an infection of the wheat plant from without, but to the fungus which is already within the wheat plant in an invisible condition becoming visible as it forms the hyphae of its normal and aggressive state. The theory is daringly original; if it be true it offers a simple explanation of a very puzzling problem. On the face of it it seems impossible; but, of course, that is the last reason that should be given for rejecting it. In vegetable organisms the living protoplasm of the plant is protected by a cell wall. With the exception

of a relatively few organisms on the borderline between plants and animals, this holds good for all plants throughout their whole life, except at a brief period in which egg and sperm unite. We need, therefore, the strongest possible reasons for abandoning this view, and for believing that a fungus with such an elaborate life story, and with so many different spore forms as *Puccinia*, will at times abandon its very structure, and exist simply as naked protoplasm in the cell of another plant. We owe to the late Professor Marshall Ward, of Cambridge, a most prolonged and critical examination of Eriksson's hypothesis. He first of all studied in detail the full story of infection of wheat leaves by the spore. The germ tube was watched; it was seen extended along the surface of a wheat leaf till it came to a breathing spore. Then the swelling of the hypha was watched, its entry through the pore, and the subsequent growth of the hyphal branches along the inside of the leaf between its cells. These internal hyphae were watched putting out their suckers into the cells, so getting into the closest contact with the living substance of the wheat plant they contained. In this manner the formation of a disease spot or lesion, to use the medical term, was watched in every phase of its development. The examination of many hundreds, even thousands, of sections convinced him that all the hyphae in any lesion radiated from an original centre of infection by a spore. He says, "I have never been able to detect the slightest sign of the fungus in any area not infected from outside." Ward readily agreed with Eriksson that no trace of the fungus could be found in the seed, embryo, or young plant on germination. The difference in their opinions was that Ward held that the rust was not there, Eriksson that it was there, though in a form not discoverable by any microscopic methods known.

Ward further searched most carefully for the special "corpuscules" in which form Erikson, it will be remembered, declared that his mycoplasm first materialised within the leaf. Ward frequently saw such bodies in the wheat cells, but they were, in all cases, nothing but the suckers that the rust hyphae outside had inserted into them. Sometimes Ward's sections would show these apparently isolated and not connected with any hyphæ. These Eriksson would say were "corpuscules" of mycoplasm not yet grown out. Critical examination always showed, however, that such an appearance was due to the way the section of the leaf was cut. The connection of the "corpuscule" with a hypha could always be found if the preparation was favorable. In short, one is forced to the conclusion that the mycoplasm theory rests on a most curious inversión of the order of a series of observations. Instead of the "corpuscules" materialising out of invisible mycoplasm,

then putting out a process from the wheat cell into the spaces of the leaf, and so forming a hypha, the "corpuscles" are nothing but the suckers of the rust fungus already in the leaf, inserted into the leaf cells from outside, in order that the rust may gain its nutrition. It is difficult to see how a worker to whom we owe so many real advances in our knowledge of rusts can so curiously have inverted the true order of things. If mycoplasm does exist, it must be shown to materialise in some other form than the "corpuscules" that Eriksson has described. The utmost we can say, in concluding our examination of the much-discussed mycoplasm hypothesis, is to return a verdict in the Scots' way of "not proven."

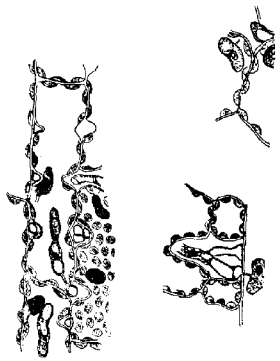

FIG. 6.—Suckers from hyphæ of rust fungus in cells of wheat leaf. Such suckers Ward suggests Eriksson has regarded as corpuscules of mycoplasm. (*From Ward.*)

IS WHEAT ATTACKED BY RUST FROM OTHER PLANTS?

How, then, are we to account for rust outbreaks? I have purposely left one of the most obvious explanations that can be advanced to the last, for it opens up such a great field of new ideas. If there be no wheat growing between harvest and the opening of the next season, why cannot the rust exist as a parasite on some other cereal or grass? At first sight, this suggestion seems so obvious that possibly some of you may wonder why I have dealt with these other possibilities that seem more far-fetched and less probable. This point brings us, however, to the great contribution that Eriksson especially has made to science. It is quite true that black rust occurs not only on wheat, but on oats, barley, and rye, as also on a large number of genera and species of grasses. Mr. McAlpine has recorded it on above 20 different species

of grass in Australia. On all these plants the fungus exists, producing uredospores and teleutospores that are, to look at, quite indistinguishable—the disease is apparently identical in all cases. Eriksson, however, finds this remarkable thing. The uredospores formed by wheat plants will not infect any of the other cereals with rust, except, perhaps, barley feebly. Those formed on rye attack barley, but not wheat or oats. Those on oats attack some other grasses, but no other cereal. There is here seen a remarkable specialisation in parasitism. The fungi concerned are clearly very different in their habits, although quite indistinguishable to look at. No doubt, the living substance forming a wheat plant differs in some ways from that forming an oat plant. We are not able to see that difference, nor can we detect it by analysis. Evidently the rust fungus can. It has accustomed itself to feeding upon the substance of one kind of plant, and for some reason cannot feed upon other kinds. Why this should be so we cannot attempt to explain; we simply have to accept the fact that it is so, indisputably proved by an ever-growing number of experimenters. In the face of this, then, we recognise that the possibility of direct infection of wheat from some other cereal crops is quite impossible, and even from some wild grass is remote in the extreme. During its evolution the fungus *Puccinia graminis* has evidently become split up into a number of sharply defined strains or varieties, each living on its own host or hosts. These varieties are sometimes called biological species, since, although they are indistinguishable by the ordinary methods of examination, they are very definitely different in their requirements in the way of food. But though the discovery of this extreme specialisation has done much to help us to get more accurate ideas on the danger of rust outbreaks spreading from crop to crop, it has brought us no nearer to answering the question of how can we account for the annually recurring outbreaks of rust disease. It must be frankly admitted that the question is a "real poser."

Wind as a Carrier of Infection.

Once the first wheat plant is infected the rest of the story is clear. The number of uredospores formed on only a single disease spot is very large. Under suitable conditions each uredospore freed can soon form a fresh spot, producing spores again in about a week. The crux of the question is—Where do the first spores of the season in any district come from? We have seen that they probably cannot remain desiccated for the whole dry season—that explanations by the occurrence of the fungus in the seed are not substantiated, that mycoplasm, to say the least, is improbable, and that the rusts are so specialised in their parasitism that those occurring on different grains are but rarely inter-

changeable. There may be some Australian grasses with a variety of rust growing on them which will affect wheat, but we do not know of any, and in other countries the danger of infection from this source is not considered great. We have to remember this, though, that the carrying power of the air is very great. Wheat is universally grown, rust is never completely absent, and uredospores are very numerous—hundreds being formed by any single small disease spot. The spores are very light—far lighter than dust particles of the same size, and we have some astonishing records of the travels of a dust particle. In August, 1883, as a result of a terrific volcanic explosion, most of the small island of Krakatoa, in the Java Sea, was blown to fragments. Half the island disappeared, and thousands of people perished. What interests us more immediately at present is that the ejected volcanic ash, carried by the wind, fell as rain at places 750 miles away, while the finest particles drifted in air currents around the whole world, causing most wonderful sunsets. In March, 1901, dust clouds arising in Northern Africa were, during the next two days, the cause of dust showers that fell in the Alps, in Hamburg, and the Danish Isles, as the particles drifted northwards. Surely rust spores, that are so much lighter, may reasonably be assumed to be carried over distances at least as great as particles of sand and grit from the Sahara Desert? It has been proved that large numbers of rust spores are present in the air at various times. Cotton plates placed in the open have been found to collect thousands of uredospores in the course of a wheat season. More interesting still are some experiments carried out in the last few years in the United States of America. Dishes containing water were exposed for four hours on various days in the spring months at the top of a building in the University at Minneapolis. On examining the dust collected in this water, several uredospores of *P. graminis* and other rusts were found. Such experiments have been repeated on several occasions in the early spring, and the uredospores obtained. Now, Minneapolis is in the north of the United States of America, and at that season there is no rust to be found in the wheat fields of the district. The uredospores must have been blown for some distance—it is suggested from the wheat fields of Texas, in the south, in which rust is usually plentiful at that date. The uredospores may not be able to survive the long drought of the summer, but they can live for days, or even a few weeks, in a dry condition. This is ample time for them to be carried in air currents for thousands of miles. In Australasia we have a very great range of climates, so that in view of what is known for the United States of America, the suggestion that spores formed in one State may cause infection in another is not so unreasonable as it might at first sight appear to be.

Epidemics.

Though in every season there is present in the crop a small amount of rust, it is fortunately only seldom that the disease is at all abundant. When this is so, we may say that there is an epidemic. It is generally believed that these seasons in which epidemics occur are marked by special climatological conditions. A period of warm, muggy weather, following an unusually abundant rain, is usually regarded as favorable to a serious outbreak. Why this should be so is not generally understood, and seasons are known when the weather has been such as to make an epidemic likely, yet, fortunately, it has not come off. There evidently are a number of conditions to be fulfilled before the disease can become of sufficient importance to be regarded as an epidemic. It will be seen that as rust is a fungus attacking a living plant, two distinct organisms have to be considered. We may state that at least three conditions must be fulfilled. There must obviously be present a sufficient number of spores to give the fungus a start. The weather conditions, especially those of moisture, must be suitable, for the uredospores need water upon the leaves in which to germinate. Finally, the crop itself must be in a suitable state to catch the disease. What is meant by this last condition it is difficult to state shortly, but while wheat may, of course, develop *P. graminis* at any time, it is particularly liable to do so when the ears first appear. Just as we ourselves may at times be more liable to catch colds, influenza, or more serious diseases, so plants, too, have undoubtedly periods in their life when they are susceptible to attacks by a parasite, and others when the parasite can do little or no damage. (In our next lecture, when considering disease in general, we shall return to this point). *P. graminis*, too, is only one of several rust fungi known to attack wheat; we have one other rust in Australia. Each of these seems to have its special season, a period in the life of the wheat plant when it can attack and do most damage. At other times the same disease may be almost harmless. Again, parallels in diseases of human beings will occur to your mind, as the diseases attacking in childhood and not in adult life.

Immunity.

One of the most striking features of a rust attack on wheat plants is the fact that while some wheats will have the disease badly, others will only suffer to a slight extent or not at all. We say that those plants which are not attacked are immune to rust, or, at least, rust-resistant. The mere giving of a name to a natural occurrence settles nothing. The intelligent mind at once asks why. It has often been asserted that immunity is a result of some difference in structure between the two varieties. That great Australian benefactor, W. Farrer, inclined to

this view, and many others with him. In this connection the work of Marshall Ward on a rust attacking various grasses, known as *Bromus*, is of great interest. Bromes are among some of the commoner grasses occurring naturalised about Adelaide; some few are of great fodder value, such as the prairie grass, *B. unioloides*. Now the genus *Bromus* is a very large one, and the various species show a considerable range of

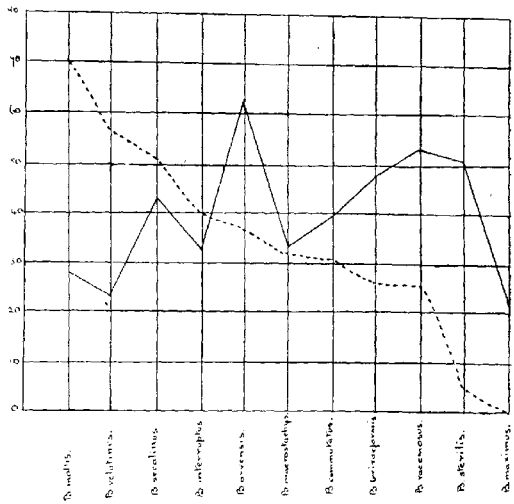

FIG. 7.—Curves showing relative susceptibility to infection by rust and number of pores (stomata) per square m.m. on leaves of certain bromes. The species are arranged in order of susceptibility, with the most resistant on the right. It will be seen that the curve (solid line) showing the number of pores has no relation to that (dotted line) showing the resistance to the disease. (*Modified from Ward.*)

form, habit of growth, difference in hairiness. They also show a great variability in the way they suffer from the rust attacking them. Ward tested then some 20 different species, comparing their structure with their relative immunity to the disease. The work was most detailed: let us consider but two points. The uredospores infect a plant by growing through its breathing pores or stomates. It might reasonably

be suggested that if the leaves of a species have many more breathing pores than the leaves of another, so many more points of entry for the fungus will be provided. Consequently, the former leaf will be more badly rusted than the latter. So it might seem; but in point of fact it is not so, as the accompanying curve shows. The immunity has no relation whatever to the number of stomata on any given area.

Similarly, it might be suggested that a hairy leaf would retain more spores than a smooth one, and hence be more seriously attacked.

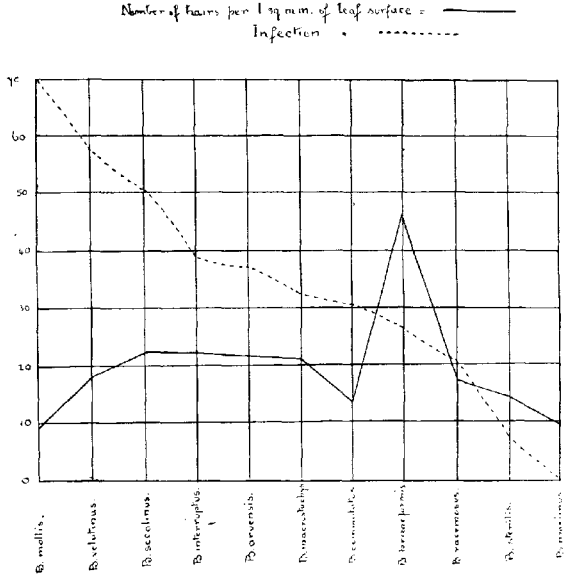

FIG. 8.—Curves showing relative susceptibility to infection by rust and number of hairs per square m.m. of leaf surface in certain bromes. As in the case of the number of stomata (fig. 7), the number of hairs has no relation to the degree of resistance to rust shown by a species. (*Modified from Ward.*)

Again, the curve shows that the relative immunity to rust is quite independent of the number of hairs. The only possible conclusion that can be reached may be stated in Ward's words—"That the capacity for infection or for resistance to infection is independent of the anatomical structure of the leaf, and must depend on some internal factor or factors in the plant." Immunity to disease in the brome grasses, and we may well believe that it holds for other plants, too, depends

upon a physiological character of the plant attacked. It rests upon that indefinable thing that we call the constitution of the organism.

In this connection it is most interesting to note that uredospores falling into a drop of water upon the leaf of an immune wheat will germinate just as they will in any drop of water. Moreover, they grow towards a breathing pore on that immune leaf, and may even enter it, by passing between the two cells guarding the hole. Yet the fungus produces no disease. These attempted infections of immune wheat by rust have been carefully studied by several investigators. In some cases the fungus grows through the pore and develops no further. It seems as if the wheat plant had some substance in its sap that the fungus could not absorb, consequently it starves and dies. The behavior in other cases is even more striking. The hypha passes through the pore and begins to grow amongst the cells of the leaf. These cells rapidly die on all sides, possibly because the fungus forms a substance that is a violent poison to the particular variety of wheat. Therefore the fungus hypha is left surrounded by the dead cells of its host, and consequently dies itself of starvation, because it can only feed upon living material of the host. So that in such cases the disease does no more harm than form very small spots of dead cells at each centre of infection. In other words, such a variety of wheat is so susceptible to poison by the fungus that it is immune to rust. It is in cases where the wheat is much less susceptible, where the fungus does not rapidly kill, but merely robs the cells of their food, that rust does serious damage. By this prolonged attack of the fungus the whole vitality of the plant is lowered, so that it has much less food to store in its grain, if, indeed, it can form viable seeds at all.

Rust Resistant and Rust Escaping Wheats.

Every effort has been made to raise and cultivate varieties of wheat which are resistant to rust. In this direction Australians owe much to William Farrer, of New South Wales, whose experiments, carried out over a long series of years, did much not only to improve the type of wheat grown from an agricultural point of view, but to breed rust-resistant varieties. However, it must be remembered that there is such a thing as a variety of wheat that can generally be grown without suffering from rust attack, but which is not really immune. We have seen that at least three conditions must be fulfilled, in order that a disease shall become epidemic—there must be the fungus spores in quantity, the right weather conditions, and the plant attacked be in the right stage to catch the disease. Now, many varieties of wheat that are rust proof are so because they mature early

in the season, so that the critical stage, when they are most liable to suffer from rust, which is when the ears are first emerging, is passed before the other conditions of weather and spore numbers are fulfilled. They are not really disease resistant, but disease escaping. This point may not seem to you to be of great importance to the grower, who is concerned in raising a clean, healthy crop, and who probably, very naturally, cares but little about such an intangible thing as the constitution of his plants. It is, however, a matter of great importance, for the reason that a variety may be perfectly rust free in one place, and the same variety badly attacked in another. The variety is not really immune at all; it merely is disease escaping. When planted elsewhere it becomes attacked because the alteration of conditions may so affect its growth that it will reach the critical period for infection at the same time that the other conditions of weather and presence of spores are fulfilled. Thus it is that the varieties suited to one country behave quite differently in others.

That this is not merely a matter of soil difference is shown very clearly by some interesting work conducted in the United States of America during 1909-1912. The wheats grown in California, Kansas, and Maryland differ considerably in the chemical and physical properties of their grains. Is this difference due to soil or climate? Experiments show it to be due to climate. "Fairly good wheat soils, one each from California, Kansas, and Maryland, were put down side by side in each of these three localities and cropped with the same variety of wheat.' The result was that the crop raised in Maryland, was uniform, whether it was grown on Maryland soil or that from the other two States. Similar results were obtained in California and in Kansas—surely an excellent demonstration that it is not the soil, but the climatic conditions, that influence the type of wheat produced. Attempts have often been made to show that a plant varies in its degree of resistance to disease when it is starved or well manured. Except in cases of excessive nitrogen supply, they have completely failed. We can confidently say, then, that the immunity problem is capable of no such simple solution as the mere nutrition of the crops. It is with plant diseases as with animal diseases, the further you investigate them the more complex the problems become, owing to the interference of quite unforeseen and as yet very intangible factors.

In the past 50 years the advances that have been made towards a solution of the rust problem are tremendous. Rust is no longer a mysterious visitation greatly to be feared. It is a well recognised fungus disease, and the damage that it causes has in most years been

reduced to a minimum. Two classes of investigators have by their discoveries brought about this change—they are the botanist in his laboratory and the plant breeder in his field plot. But great though the advance has been, there is yet more to be accomplished. There is still the danger of the exceptional year, when by a combination of unusual circumstances even the most resistant wheat may succumb to attack. To the same two sets of investigators we must look for still further advances, remembering that, as Milton has said:—"The light which we have gained was given not to be for ever staring on, but by it to discover onward things, more remote from our knowledge."

BLACK APHIS OF THE PEACH.

"The best remedy for the black aphis of the peach," said Mr. Quinn (Horticultural Instructor) in reply to a correspondent, "I believe to be strong tobacco and soap wash, into each gallon of which one pint of resin compound is mixed. The tobacco wash is made by simmering for a couple of hours in hot water, or steeping for a couple of days in cold water, tobacco waste at the rate of from 2ozs. to 4ozs. per each gallon of water, then into the strained liquor dissolve common soap 1oz. per gallon. The resin compound is made by boiling resin, washing soda, and soap, at the rate of 1lb. powdered resin, 1lb. washing soda, ½lb. soap in each 5galls. of water, until all are dissolved into a strong brown liquid. The resin wash can be kept almost indefinitely, and used as required. It may be made more concentrated for keeping, and diluted as needed for spraying. If these washes can be applied fairly warm, their killing powers are increased."

BREAKDOWN, OR COLLAPSE, IN MILCH COWS.

[By T. H. Williams, Chief Inspector of Stock.]

Owners of milch cows in many localities in the State sustain serious loss every year through their cows suddenly going off their milk, and becoming sick. Practically no symptoms of the approaching collapse have been noticed beyond the fact that the cows have been ravenous after bones, old leather, and various other articles quite foreign in the way of natural food. They are known as "bone-eaters." Sooner or later these are the cows which "break down," or collapse, as the American authorities term it. Some years ago the veterinary officers attached to the American Bureau of Animal Industry carried out a series of investigations extending over some years, with a view of discovering the cause of the trouble in milch cows, which were practically the only animals affected. As the final result of the investigations, they now say that want of a constant and sufficient supply of salt is the main factor. Every cow in milk needs not less than 3oz. of salt daily. Pregnant cows not at the pail need not less than 2oz. daily. During the investigations, large numbers of cows were dealt with. In some cases, where large herds of milch cows were running on the same pasture, half were allowed 3oz. of salt daily, while it was withheld from their companions. The results were surprising, as in some cases all the cows which did not receive salt "broke down," while the others remained healthy.

A Good Stock Lick.

The investigations made by the Americans do not stand alone, as the authorities in this State have been urging cow owners to supply salt to their cows, and where this has been done systematically the results have been equally satisfactory. Owners must realise that a spasmodic supply of salt does not fill the bill. Probably the best method of administering this condiment where cows are hand-fed, is to put it in their feed daily.

The formula for mixing a good stock lick is as follows:—100lbs. salt, 100lbs. fine bonemeal, 1lb. sulphate of iron; thoroughly mix and place about in strong troughs or boxes. To induce the stock to take to the lick, sprinkle a little chaff and bran on it. Owners must realise that the lick is simply a condiment to aid digestion and counteract the craving for bones. It does not follow that because the lick is supplied animals can do on a reduced diet deficient in nourishing properties. The average milch cow requires anything from 24lbs. to 28lbs. of sound nutritious food and from 8lbs. to 10lbs. of roughs daily, otherwise she will

lose condition, and the milk will decrease in quantity and become poor in quality. This brings us to the question of dry *versus* wet feeding of cows. It is a common practice to put water with chaff and bran, and in this form it is readily eaten, but many animals so fed soon develop derangement of the digestive functions, and the explanation is that wet sloppy food is bolted without being properly masticated, and is not returned to the mouth again for cudding. It has been observed at *post-mortems* on sloppy fed cows, which have succumbed through weakness owing to impaired digestion, that the stomachs and bowels are flaccid and pale, and lack vigor. On the other hand, cows fed on dry chaff and bran must chew it thoroughly before they can swallow it, thus mixing the saliva of the mouth with it. In this way it is made ready for rumination, and natural digestion later on. There is no doubt that food taken in this form is more readily digested and assimilated than it is when wet and sloppy. Cows always do better when given a few pounds of long hay or sound straw, following chaff and bran.

Cows on Mallee Country.

The question will probably arise as to whether the pastures between say, Cooke's Plains, Keith, and Wirrega, etc., are suitable in all respects for cows, and the answer must be "No! not at present," as the bulk of the soils are of a light sandy or limestone character, from which mallee and other timber has recently been cleared. Cattle, particularly milch cows, will need to be hand-fed for quite 10 months of the year. With manures and cultivation we may reasonably hope that the time is not far distant when good natural pastures will become thoroughly established, as has been the case in other parts of the State where whipstick mallee alone grew. All stock will no doubt do better if part of their chaff supply can, for a year or so, be drawn from that grown on the stronger soils of the State.

The Water.

The effect of impure water on cattle is so vital that the matter cannot too seriously engage the attention of owners. No matter how good their feed may be, cattle will die of toxæmic paralysis if their water supply is deficient and impure. A cow of from 6cwts. to 7cwts. needs from 5½galls. to 10galls. of pure water daily. The disastrous effects of impure water on cows on many farms in this State have frequently been observed, and the mortality attributed to all sorts of causes but the right one. On no account should stock have access to dams, or other stagnant water supplies. The water must be raised and supplied from troughs. Most of the mortality of stock in the South-East is due to the fact that

during summer they are forced to drink at the small filthy dugout waterholes and swamps, where the fluid is teeming with parasitic life, chiefly the various kinds of worms which cause disease and death. From an economic point of view, the supplying of pure water to stock means many thousands a year in the pockets of owners. The motto should be, "I need pure water. So do the creatures which are under my management and care."

ADVISORY BOARD OF AGRICULTURE.

The usual monthly meeting of the Advisory Board was held on July 12th, there being present Messrs. F. Coleman (chair), A. M. Dawkins, J. Miller, W. J. Colebatch, T. H. Williams, G. Jeffrey, Professor Perkins, Col. Rowell, and the Acting Secretary (Mr. H. J. Finnis).

Poisoning Destructive Birds.

The question of destroying pestiferous birds was again brought under notice, and opinions of ornithologists, as expressed before a Conference of interested parties, held in 1909, read and considered. Action was deferred until the next meeting.

Instruction for Murray Settlers.

The provision of suitable instruction and guidance for irrigationists on the newly-opened River Murray settlements was discussed at length, and ultimately a sub-committee consisting of the Chairman and Messrs. Laffer, Dawkins, and Jeffrey, was deputed to wait on the Minister of Agriculture in regard to the matter.

Life Membership.

The name of Mr. A. L. McEwin, of the Blyth Branch, was added to the list of life members of the Agricultural Bureau.

Branch Business.

The formation of a new Branch of the Bureau at Cummins was approved, and a request from Tintinara that the Branch should go into recess until the termination of the war, was assented to. Seventy-three names were added to the rolls of existing Branches.

EXPERIMENTAL FARM HARVEST REPORTS.

By W. J. Spafford, Superintendent Experimental Work.

5.—EYRE'S PENINSULA EXPERIMENTAL FARM.

Manager: Mr. L. J. Cook.

This farm consists of 3,041 acres, comprised of the sections 26, 27, and 28, in the hundred of Minnipa, situated 158 miles north of Port Lincoln. It is fairly centrally situated as concerns the whole of Eyre's Peninsula, and will be the point from which departmental activities in agricultural matters on that vast stretch of arable land will proceed. It should serve to advertise the possibilities of this practically unknown country, and should hasten the day when up-to-date farming methods are the recognised practice of that part of the State. The whole of the farm is gently undulating, and practically the lot of it can be put under cultivation. The above-mentioned sections were dedicated as a reserve for agricultural experimental purposes in November, 1914. A manager was appointed from January 1st, 1915, and operations were commenced in that month.

The Season 1915.

This being the first year of the farm there are no previous rainfall figures with which to compare this year's fall. There was very little rain in the first three months of the year a total of 85 points only. A fall of a little over an inch was registered in April and 2in. in May being nice rains for seeding operations. The falls of June, July, and August were good; but September eased off considerably by only producing 1in. of rain, and October only gave less than half an inch. In November nothing fell, and in December only 44 points were registered. The table following shows the monthly falls at the farm:

Rainfall Distribution, Eyre's Peninsula, 1915.

	Inches.
January	0·74
February	0·09
March	0·02
April	1·18
May	2·03
June	1·88
July	2·54
August	3·57
September	0·98
October	0·41
November	—
December	0·44
Total	13·88

Distribution of "Useful" Rainfall.

The rainfall, though low, was distributed very well, as the following table showing the distribution of "Useful" rainfall indicates:

Distribution of "Useful" Rainfall, Eyre's Peninsula, 1915.

	Inches.
Seeding rains (April-May)	3·21
Winter rains (June-July)	4·42
Spring rains (August-October)	4·96
Early summer rains (November)	—
Total "Useful" rain	12·59

These figures show good seeding rains, fair winter rains, and very fair spring rains. It would have been an improvement to have received some early summer rains; but there was a sufficiency of spring rains to bring the crops properly to the hay stage.

Crops.

Starting a farm covered with scrub in January does not give much time to prepare land for cropping; but as there was a possibility of the land comprising the surrounding hundreds being allotted to settlers this year, we recognised what a great advantage it would be to these settlers to be able to obtain fodder for their stock close to their farms, so it was decided to at least put in some cereals for hay. The greater part of the farm is heavily timbered; but surrounding the Yarwondutta Rocks, which are situated on the property, was a strip of country with only a few trees, but covered with bushes 6ft. to 8ft. high, consisting principally of acacias, cassias, alyxias, geijeras, hakeas, santalums, &c. This block was thoroughly cleared by pulling the few trees with a machine and removing the bushes, roots and all, with horses on a heavy chain. The land was ploughed as soon as cleared, and harrowed before being drilled.

The seeding consisted of the following cereals:—

Cereal Crops for Hay, Eyre's Peninsula, 1915.

Variety	Area.	Seed per Acre.	Super. per Acre.	Date Sown.
	Acres.	lbs.	lbs.	
Algerian oats	48	78	113	May 5–8
Silver King	37	75	90	May 19–22
King's Red	35	92	96	June 15–17
Gluyas	14	83	120	June 18–19
Eclipse	14	82	120	June 19–21
Total area	148			

The whole crop was harrowed immediately after seeding. The oats were sown "dry," and the surface of some patches in the crop caked after the first rain. This necessitated another harrowing of these small patches. Part of the King's Red germinated badly, so it was resown with 45lbs. Eclipse wheat to the acre.

Yield of Hay.

The whole of the crop was cut for hay and produced—on stack measurement—280 tons of hay, or a yield of 1 ton 17cwts. 94lbs. to the acre.

This is a very fair yield, but would have been considerably higher could the seeding have been completed early enough. This was shown by the crops that were sown in May: the oats did remarkably well, the Silver King was a good deal above the average, and a narrow strip of King's Red that was put in at the same time produced a really first class crop of hay. The later sown wheat did not have time to produce much growth, still the quality was first class and the growth was very fair.

SHEEP ON SMALL AREAS.

Mr. Henshaw Jackson (Wool Instructor to the School of Mines) addressed the Conference of the River Murray Branches of the Agricultural Bureau on this subject.

Whilst as far back as B.C. 106, Cicero had stated in his book of the farm that "the feeding of cattle is the most important part of agriculture," there was still every need, said Mr. Jackson, to constantly advocate the feeding of sheep.

It was interesting to note that a New Zealand farmer was reported to have turned off 1,535 lambs from an area of 36 acres, and whilst the statement was a startling one, it indicated the possibilities of the industry under a system of hand feeding. Experience had proved that in Australia they could do better with sheep and wool than had ever been accomplished in any other part of the world. However, in so far as feeding was concerned, Australian sheep men seemed content to leave that aspect of farming to the dairymen, and omitted to apply his methods to increase the mutton and wool production as did the dairyman his milk and butter.

A recorded production of 60 tons of green fodder per acre by a dairy farmer in Victoria, and the possibilities of others securing similar high returns by systematic and careful cultivation, manuring and rotation of crops, suggested big things in the way of feeding sheep.

He advised sheepowners to try the effect of feeding their stock on sorghum, cowpeas, and green corn. By way of trial they could put 10 acres under forage crops, and draft off even as few as 50 sheep to feed and fatten thereon.

Up till the present they had been sheepbreeders in the pastoral sense, and successful ones, too. In the future they should be sheepfarmers, and there was a vast difference between the two businesses. Sheepbreeders need have no fear, however, and should do all in their power to encourage sheepfarming, because the greater the number of sheepfarmers the more need there would be for those who possessed the gift of breeding sheep, and who would be called upon to supply the wants of farmers in replenishing their flocks from year to year. Failures there had been, and they might occur again, on the part of those who had gone in for breeding sheep of the British breeds; but such failures had largely been the result of crazes for some particular variety without any real trials having been made in connection with

it. Perhaps those who took up that work had been perfunctory in their methods, or thought it enough to buy the sheep and let Nature do the rest. He had seen cases of that kind, and knew of at least one flock of a British variety that had been dispersed by auction and scattered throughout the State, and on the very same property came another man who bought some of the original flock, added others of the same breed, and was to-day doing well where the previous owner failed. It was mainly a question of knowing how. If they kept sheepfarming distinct from sheepbreeding, men would gradually find their own level at both games, and in time each would flourish.

Feeding.

Of the three departments of sheep husbandry, the most important was feeding. The blood of a thousand years, the longest and most celebrated pedigree was, after all, nothing but the outcome of good feeding. Under the term "feeding" should be included care, management, choice of sheep suitable to surrounding conditions, &c. The skilful breeder could select an animal with consummate insight into its good points, but he could not change its former fleece one iota, except by combination with another sheep (breeding), and especially by care and management (feeding). Nature made all the changes herself, man only supplied the conditions. Good feeding simply gave Nature or heredity a chance to do the best. The life of sheep on out-back pastoral areas developed muscle, but weakened the fibre of the fleece, and heredity possibly tended to perpetuate these characteristics: but with good pasture available, and full hayricks, and faithful daily care, a good carcass and a healthy, robust fleece could be produced. A sheep, just as much as any other member of the farm livestock association, was entitled to a square meal, not only now and then, but all the time. Apart from the question of a fair deal to the sheep in the direction of fodder it became compulsory to see that they had sufficient, if there was to be any profit in having them on the farm. So far as quantity went, when it became a matter of necessity to feed sheep for maintenance a pound of chaff plus a fourth of oats would not only support the animals in comfort, but would even put them a little forward in condition, and ready to take advantage of the rich, natural herbage and grass when it came along. With regard to quality of food, nutrition values and nutritive ratios, seeing that they were only at the A B C of sheep feeding in Australia, before they tackled decimal fractions and quadratic equations, they had better take the simple addition factors of the sum, and learn to begin with the axiom that one sheep and 1lb. of wheaten or oaten chaff would do

very well, and with the addition of another pound of chaff and ¼lb. to ½lb. of oats or barley it would become an important help in moving off any mortgage or liens that might be around the place. A sheep, plus 2lbs. cocky chaff, dampened with molasses, at the rate of a quart to 4galls. of water, would also appear as an animal not to be ashamed of, while a sheep plus 2lbs. to 2½lbs. lucerne hay, or 6lbs. to 8lbs. green lucerne, had better be sent to market to break mutton records. The rations mentioned—all easily procurable on the farm—would keep sheep going strong as regular revenue producers. The rules, after all, were fairly simple, and they could easily remember that a sheep, like the cow, needed bulk in its ration, and that could be supplied in the shape of chaff and hay, while any increase in the flesh-forming constituents of fodder could be added by including an extra amount of grain. A comparison of the price of hay and grain, when sold as such, and the price of it when walked off the farm by sheep, would show something of the future before the business of sheep farming when undertaken as a business. The art of feeding took account of all that the sheep required to promote its health and growth. Not only feed, but the water had to be considered.

Mineral Requirements of the Sheep.

The sheep needed a large proportion of mineral matter, either in its feed or in the water. Five per cent. of clean wool was sulphur, 2 per cent. of the sheep's urine was mineral, 13½ per cent. of the dung was mineral, the bones contained 60 to 70 per cent. of phosphate and carbonate of lime; the yolk had a large proportion of potash; and the flesh and blood contain phosphorous, sodium, potassium, chlorine, magnesia, iron, and lime. The bones of the sheep contained 11 per cent. more carbonate of lime than those of cattle, 5 per cent. more phosphate of lime, and a fraction more of magnesia, lime, and potash. That showed the necessity for supplying the sheep with mineral substances, and explained why hard water was much better for a flock than soft water. So far as sheep were concerned, the bulk of their mineral requirements could be found in the home-grown crops, and with the addition of rock or coarse salt readily available, they would be found to do well enough. At the same time one wishing to see the effect of a specially compounded lick might mix salt 40 parts, lime 5 parts, sulphur 5 parts, and place it where the animals could get it. A more elaborate mixture, that the average man might not care to trouble about, was the following:—In parts, salt 30, phosphate of soda 9, fluoride of calcium 1, sulphate of iron 1, bone ash 30, chalk 14, sulphate of magnesia 10, wood charcoal 2, sulphur 3.

THE POSSIBILITY OF SURPLUS HAY IN TERMS OF SHEEP.

If they took that year's hay crop of all kinds as 1,100,127 tons, and allowed half of it for use in feeding other stock used on the farm, principally horses, and the remainder as sheep feed, it would support more than 3½ million ewes in good enough condition to grow a fleece of wool and bring a lamb. That, too, if it were necessary to feed every day in the year, which was not likely. When it came to fattening for market, harvest reports showed that there was a sufficiency of all kinds of grain, leaving wheat out of the question, to satisfactorily send the surplus stock away as fats. That was of the utmost importance, in view of the future of the meat market. Australia was in no position at the present time to cope with anything like the demand that would set in for meat once the war was over. They could remedy that in time if they seriously undertook the proper care and feeding of livestock. But they would have to begin at once. There was every reason that Australia should become the meat emporium of the Empire, if not of the world. The start in that direction should be made by improving the methods of feeding stock.

CO-OPERATION.

At the recent Conference of River Murray Branches of the Agricultural Bureau the Director of Irrigation (Mr. S. McIntosh) contributed a paper. The present, he said, was a most fitting opportunity to give consideration to the benefits which were to be derived from the inauguration of a complete co-operative system of preparing and marketing the produce of settlers along the Murray, more particularly those on the irrigation and reclaimed areas, in addition to the purchase of stores, implements, &c. After dealing shortly with various local co-operative efforts, he stated that, when it was considered that for the bulk of the lines of produce grown along the Murray Valley, the producer did not get more than from 50 per cent. to 60 per cent. of the amounts charged the consumer, it

was apparent that the middlemen were securing a handsome profit. At an early date in the history of the industry the dried fruit growers at Renmark and Mildura had formed a co-operative system, and settlers should now combine to market their milk, cream, butter, cheese, bacon, &c., and provide for the purchase of stores and requisites. Brief reference was made to the work accomplished by co-operation in Switzerland, France, Belgium, Italy, Germany, and more fully, in Denmark and Holland. In Denmark, he said, when the erection of dairy or cheese factories was contemplated, the necessary capital was borrowed, and guaranteed by the local farmers in proportion to the amount of milk to be supplied by each. Of late years no failures had occurred, which justified the assertion that the liability did not press hard upon the producers.

Credit Union Banks.

Throughout Denmark there was a system of Credit Union Banks, which constituted a further semi-co-operative movement. No assistance was given by the State by means of guarantee or loan, but the banks were inspected and their accounts were continually audited by Government auditors. A credit union of landholders was formed with the object of securing for its members mortgages on their properties. The landholder who desired to raise an amount on his property gave a bond to the union and received the loan, not in cash, but in bonds issued by the union. These he realized by selling on the money market. The credit unions would advance loans up to half the assessed value of any property, and the person receiving the loan was required to pay a certain amount toward the reserve fund of the credit union by which it was granted, and also an additional proportion toward administrative expenses. Losses incurred were met out of the reserve fund first, and secondly, in equal proportion by members. The members were jointly and severally responsible for the obligations of the union.

The paper concluded with statistics illustrating the scope and advantage of co-operation.

FARM COMPETITIONS.

The Naracoorte Branch of the Agricultural Bureau, prompted by a desire to foster an improvement in the agricultural practice of the district, has inaugurated a series of agricultural competitions for persons farming or residing within the boundaries of the District Council of Naracoorte. Prizes are being offered for—(1) The best worked and managed farm of an area of 500 acres or over; (2) the best worked and managed farm of an area less than 500 acres; (3) the best growing crop of wheat of not less than 25 acres in extent; (4) the best worked area of 25 acres or over of fallow land; (5) the best growing crop of Algerian oats of an area not less than 25 acres; and (6) the best kept orchard, vegetable and flower gardens, for owners of not more than 100 acres of land.

It is evident that this commendable attempt at improving the agricultural practice of the district will, if supported by landholders with that enthusiasm which it warrants, have a far-reaching effect.

The object of the promoters is perhaps best indicated by the system of point judging to be adopted in connection with those classes for the best worked and managed farms. The factors which are to be taken into consideration by the judges, and their respective point values, are as follows:—(1) The best system of cropping, including cultivation methods, rotations, and manures, 40; (2) the cleanest and best growing crops, 25; (3) the fallow in the best order area to be considered, 20; (4) the best quality and serviceable class of stock kept on the farm (horses 25 points, sheep 20, cattle 15, pigs 5, and poultry 5), 70; (5) the most complete equipment and class of implements and machinery, 25; (6) the general care of implements, harness, and farm equipment, 20; (7) the best system of boundary and subdivisional fencing, and including gates, and sheep, horse, and cattle yards, 20; (8) the best arranged system for conveying surplus surface water from farm land, 20; (9) the best reserve of and provision for fodders, 25; (10) the best system for watering stock and for water supply, 20; (11) the best time and labor saving appliances and methods, 20; (12) the best arranged dwellings and outbuildings, 25; (13) the best arranged and kept orchard and vegetable garden, 10; (14) the best efforts at beautifying the homestead (tree planting, flower gardens, &c.), 10; (15) the best experimental work of any kind being conducted, 25—total, 375.

ANALYSES OF FERTILISERS.

The following are the results of analyses made by the Government Agricultural Analyst (Mr. C. E. Chapman), of samples of fertilisers taken by inspector and assistant inspectors under the Fertilisers Act since the beginning of the present year :—

Name of Firm and Fertiliser.	Phosphate.						Nitrogen.		Potash.	
	Water Soluble.		Citrate Soluble.		Acid Soluble.					
	Vendor's Guarantee.	Result of Analysis.	Vendor's Guarantee.	Result of Analysis.	Vendor's Guarantee.	Result of Analysis.	Vendor's Guarantee.	Result of Analysis.	Vendor's Guarantee.	Result of Analysis.
Adelaide Chemical & Fertilisers Co., Ltd.—	%	%	%	%	%	%	%	%	%	%
Mineral super.	36·0	40·2	—	—	—	—	—	—	—	—
Mineral super. (from Bee & Hill's store, Saddleworth)	36·0	41·1	—	—	—	—	—	—	—	—
Mineral super. (from Jas. Bell & Co.'s store, Wallaroo)	36·0	41·1	—	—	—	—	—	—	—	—
Mineral Super. (from Heinrich Bros.' store, Freeling)	36·0	38·1	—	—	—	—	—	—	—	—
Mineral super.	36·0	37·6	—	—	—	—	—	—	—	—
S.A. super.	30·0	37·0	—	—	—	—	—	—	—	—
S.A. super. (from Bee & Hill's store, Saddleworth)	30·0	30·2	—	—	—	—	—	—	—	—
S.A. super. (from Jas. Bell & Co.'s store, Wallaroo).	30·0	29·8	—	—	—	—	—	—	—	—
S.A. super.	30·0	34·6	—	—	—	—	—	—	—	—
Guano super.	27·0	30·4	3·0	1·3	3·0	2·7	—	—	—	—
Guano super.	27·0	24·7	3·0	3·4	3·0	5·9	—	—	—	—
Guano super. (from Bee & Hill's store, Saddleworth)	27·0	29·3	3·0	3·7	3·0	5·7	—	—	—	—
Guano super. (from Jas. Bell & Co.' store, Wallaroo)	27·0	35·5	3·0	1·4	3·0	3·4	—	—	—	—
* Special bone manure	—	—	—	—	17·50	10·2	2·40	0·99	—	—
Bonedust	—	—	—	—	43·00	42·7	3·25	3·9	—	—
Bone super.	15·0	14·4	15·0	8 8	4·0	11·3	1.60	2·2		
Anders, E., & Sons—										
"Victor" bonedust	—	—	—	—	40·00	42·	3·00	4·4	—	—

Crompton & Son—										
Pure bonedust	—	—	—	—	42·67	46·1	3·8	3·5	—	—
Vineyard manure	—	—	—	—	27·00	26·7	4·0	6·6	—	—
S.A. Fertiliser Co., Ltd.—										
Guano super.	26·0	23·1	4·0	5·1	6·0	6·1	—	—	—	—
Guano super. (from Bee & Hill's store, Saddleworth)	26·0	26·1	4·0	5·5	6·0	5·6	—	—	—	—
Guano super. (from Heinrich Bros.' store, Freeling)	26·0	26·3	4·0	4·2	6·0	7·9	—	—	—	—
No. 1 super.	36·0	39·4	—	—	—	—	—	—	—	—
No. 1 super. (from Bee & Hill's store, Saddleworth.	36·0	39·2	—	—	—	—	—	—	—	—
No. 1 super. (from Heinrich Bros.' store, Freeling)	36·0	38·2	—	—	—	—	—	—	—	—
Special super.	45·0	46·4	—	—	—	—	—	—	—	—
Special super. (from Heinrich Bros.' store, Freeling)	45·0	46·0	—	—	—	—	—	—	—	—
No. 2 super. (from Heinrich Bros.' store, Freeling)	30·0	30·5	—	—	—	—	—	—	—	—
Thomas phosphate	—	—	28·0	36·4	12·0	2·7	—	—	—	—
Wallaroo-Mt. Lyell Fertilisers, Ltd.—										
Wallaroo-Mt. Lyell standard super.	36·0	39·2	—	—	—	—	—	—	—	—
Wallaroo-Mt. Lyell standard super.	36·0	36·1	—	—	—	—	—	—	—	—
Adelaide super. (Y.P.)	30·0	32·2	—	—	—	—	—	—	—	—
Adelaide super. (Y.P.)	30·0	38·1	—	—	—	—	—	—	—	—
L.L.G.E. (Lewis Island guano enricher)	28·50	31·4	4·50	1·9	5·0	6·3	0·25	·4	—	—
Guano super.	27·0	29·2	3·0	1·2	3·0	2·3	—	—	—	—
Wheat or barley manure	28·0	27·0	5·0	1·8	3·0	4·1	1·05	·9	—	—
Wallaroo-Mt. Lyell standard super. (from Bee and Hill's store, Saddleworth)	36·0	36·3	—	—	—	—	—	—	—	—
Guano super. (from Bee & Hill's store, Saddleworth)	27·0	26·1	3·0	5·0	3·9	4·8	—	—	—	—
L.L.G.E. (Lewis Island guano enricher) (from Bee and Hill's store, Saddleworth)	28·50	25·5	4·5	3·9	5·0	11·7	·25	·41	—	—
Adelaide super. (Y.P.) from Bee & Hill's store, Saddleworth	30·0	31·0	—	—	—	—	—	—	—	—
Adelaide super. (Y.P.) (from Heinrich Bros.' store, Freeling)	30·0	38·2	—	—	—	—	—	—	—	—
Wallaroo-Mt. Lyell standard super. (from Heinrich Bros.' store, Freeling)	36·0	35·8	—	—	—	—	—	—	—	—

August 1st, 1916.

GEO. QUINN, Inspector of Fertilisers, &c.

THE 1915-16 WOOL CLIP.

The Government Statist (Mr. W. L. Johnston) has supplied particulars of the 1915-16 wool clip, as per returns from sheep farmers, and the estimated total wool production for the season under notice, as well as for the four previous seasons.

In so far as the number of sheep and lambs shorn is concerned it will be noted that in the five years just past there has been a most marked, and at the same time a regular, annual reduction. In 1911-12 6,248,714 sheep and lambs were shorn, but in 1915-16 the number that came under the shears was reduced to 3,601,861. The total clip for 1915-16 is given as 27,545,326lbs. (sheep, 26,330,005lbs.; lambs, 1,215,321lbs.), a noticeable reduction on the figures for 1911-12, viz., 51,360,794lbs. (sheep, 48,223,116lbs.; lambs, 3,137,678lbs.). It is also recorded that the average weight of fleece in 1915-16 (7.65lbs.) is lower than that of 1911-12 (8.22lbs.). The total production of wool for the State in 1915-16 (including the clip, wool fellmongered, and wool on local skins exported) is estimated at 33,969,975lbs., a considerable falling off in comparison with the figure for 1911-12, viz., 60,056,470lbs.

STATE OF SOUTH AUSTRALIA.

Wool Clip, as per Returns from Sheep Farmers, and Estimated Total Wool Production—Season 1915-16, and Four Previous Seasons.

Division of State.	Sheep and Lambs Shorn.	Wool Clip.			Average Weight of Fleece.
		Sheep.	Lambs.	Total.	
	No.	lbs.	lbs.	lbs.	lbs.
Central	704,050	4,842,641	289,334	5,131,975	7·29
Lower North	598,206	4,728,823	173,371	4,902,194	8·19
Upper North	379,341	3,301,007	127,152	3,428,159	9·04
South-Eastern	886,444	5,376,173	233,421	5,609,594	6·33
Western	348,765	2,067,131	104,789	2,171,920	6·23
Remainder State	683,055	6,014,230	287,254	6,301,484	9·20
Total clip—					
1915-16	3,601,861	26,330,005	1,215,321	27,545,326	7·65
1914-15	4,323,094	28,716,176	1,170,593	30,186,769	6·98
1913-14	5,309,702	42,069,062	2,363,167	44,431,229	8·37
1912-13	5,810,731	44,211,499	1,999,976	46,211,475	7·95
1911-12	6,248,714	48,223,116	3,137,678	51,360,794	8·22

	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.
	lbs.	lbs.	lbs.	lbs.	lbs.
Wool clip	51,360,794	46,211,475	44,431,229	30,186,769	27,545,326
Wool fellmongered	252,330	68,000	388,346	424,534	331,649
Wool on local skins exported	8,443,346	10,411,561	10,191,473	8,237,875	6,092,969
Total wool production	60,056,470	56,691,036	55,011,048	38,848,978	33,969,975

SALE OF FRUIT ACT.

The measure under this title, passed last session by Parliament, and known more generally as the Standard Fruit Case Law, will come into force on October 1st next. The Act prescribes that, with certain exceptions, no fruit may be bought or sold within the State which is not contained within one or other of the seven cases whose dimensions are given herein. A "case" is defined as any box, case, or other receptacle used, intended to be used, or capable of being used, for containing fruit.

The Act forbids the use of any case which is not stamped in a legible and durable manner on one or both ends with the name and address of the maker, and the words "Guaranteed by maker to contain"—and then follows the true capacity, conforming with that particular case, as set out in the schedule, viz., 1bush., or ½bush., or certain cubic inches, as the maker may decide.

The exceptions to the fruits which have to be sold in these cases of standard sizes are—

(*a*) Dried, preserved, tinned, or canned.
(*b*) Fruit sold by weight, measure, or number, when each sale is under 20lbs.
(*c*) Sold in baskets, buckets, casks, tubs, or punnets.
(*d*) In trays containing one layer.
(*e*) Any particular fruit exempted by Proclamation.
(*f*) Fruit sold by weight to a person registered as a "Factory buyer" for the express purpose of being made up into articles of food or drink.
(*g*) Fruit sold to a person registered as an "Export buyer" at a price per standard case for the purpose of being repacked for export outside the State, beyond Cockburn, or to Broken Hill.

Any occupier of premises used for preparing articles of food or drink, and any agent of such person may, on compliance with prescribed conditions, be registered as a "Factory buyer," or any buyer of fruit for export may register as an "Export buyer." The registration is for one year, but may be renewed from time to time, and a registration may be cancelled by a magistrate who records a conviction against any factory or export buyer for infringing the law.

Factory buyers must keep a record and submit same to any inspector on demand. The factory buyer's records must show—

(1) The name and address of the person from whom every lot of fruit was purchased.
(2) The date when purchased.
(3) The weight of each kind of fruit included in the purchase, whether delivered at the factory or not.
(4) The weight of each kind of such fruit which has been delivered at the factory.
(5) Such other particulars as may be required.

The export buyer's record must show—

(1) The name and address of the seller and the date when the fruit was purchased.

(2) The quantity stated in standard bushel cases of each variety of such fruit which is to be exported to each place.

(3) The places to which such fruit is to be exported and the quantity stated in standard bushel cases of each variety of each kind of such fruit which is to be exported to each place.

(4) Any other particulars as are prescribed.

The occupier of any premises may, on application and complying with prescribed conditions, register once during each year such premises as a packing store for the purpose of this Act.

Inspectors are empowered to enter any premises during the daytime where fruit is, or may reasonably be supposed to be sold or be packed, or be kept for sale, and may measure any case whether containing fruit or not, and may remove same for further measurement, or do any other act prescribed by regulations.

The following are the standard cases fixed in the schedule :—

SALE OF FRUIT ACT, 1915.

The Schedule.—Standards for Fruit Cases.

Name of Case.	Description of Case.	
	Inside Measurements, Clear of all Divisions.	Capacity.
Bushel case	Eighteen inches by fourteen and one-quarter inches by eight and two-thirds inches	Not less than one imperial bushel or cubical content of two thousand two hundred and twenty-three cubic inches.
Bushel case	Twenty-six inches by six inches by fourteen and one-quarter inches	Not less than one imperial bushel or cubical content of two thousand two hundred and twenty-three cubic inches.
Bushel case	Twenty inches by ten inches by eleven and one-eighth inches	Not less than one imperial bushel or cubical content of two thousand two hundred and twenty-five cubic inches.
Half-case	Eighteen inches by eight and two-thirds inches by seven and one-eighth inches	Not less than one-half imperial bushel or cubical content of one thousand one hundred and eleven and one-half cubic inches.
Half-case	Twenty-six inches by six inches by seven and one-eighth inches	Not less than one-half imperial bushel or cubical content of one thousand one hundred and eleven and one-half cubic inches.
Half-case	Eighteen inches by eleven and three-quarters inches by five and one-quarter inches	Not less than one-half imperial bushel or cubical content of one thousand one hundred and ten cubic inches.
Quarter-case	Thirteen and three-quarters inches by ten and one-eighth inches by four inches	Not less than one-quarter imperial bushel or cubical content of five hundred and fifty-six and seven-eighths cubic inches.

Provision is made for minor variations by section 7, wherein if a fruit case is of the shape necessary in order to comply with the measurements prescribed for any of the standard cases, such case shall be deemed to be of the prescribed measurements if any excess or deficiency in the cubic capacity of such case does not exceed, on the whole, 2½ per cent. of the cubic capacity prescribed for the said standard case. The question has been raised whether the kerosine case may be used in the manufacture of any of those named in the schedule. This is quite permissible. Regulations will be published shortly prescribing the necessary procedure for registration of buyers and other matters provided for in the Act.

DAIRY AND FARM PRODUCE MARKETS.

A. W. Sandford & Co., Limited, report on August 1st:—

BUTTER.—The weather during July was exceptionally favorable throughout the whole State, and as anticipated a month ago, production of dairy produce has increased substantially. Prices have receded here even to a greater degree than in the eastern States, so that at the end of the month "Alfa" was 1s. 6½d.; "Primus," 1s. 6d.; choice separators and dairies, 1s. 3d. to 1s. 4d.; store and collectors', 10½d. to 1s. per lb.

EGGS.—The season in this line still gives every promise of being an extensive one. Values fluctuated somewhat during July, the weather at times being cold and boisterous. A little export trade is still being done, prices now being:—Hen, 1s. 1½d.; duck, 1s. 2½d. per dozen.

CHEESE.—Quantities have kept up well, but prices are easier in sympathy with the lower rates ruling for butter. Local demand is good, and fair export trade continues. Present prices are 8½d. to 9d. per lb. for large to loaf.

HONEY.—Throughout the month sales have been rather slow. However, the market has only declined slightly, the range being from 4½d. to 5d. per lb. for prime clear extracted samples; second grades 3d. to 3½d.; beeswax wanted at 1s. 5d. to 1s. 6d. per lb.

ALMONDS.—Only odd consignments coming forward, which are readily placed at:—Brandis, 9½d.; mixed softshells, 8½d.; hardshells, 4d.; kernels, 1s. 5d.

BACON has been more plentiful, and the lowering in rates has caused much heavier consumption; best factory cured sides selling at 11d. to 1s.; hams, 1s. to 1s. 0½d. per lb.

LIVE POULTRY.—Good supplies have been marketed throughout the month, the numbers coming forward being substantially ahead of the corresponding period of last year, and good prices ruled throughout. Heavyweight table roosters fetched 3s. 6d. to 3s. 10d. each; nice conditioned cockerels, 2s. 6d. to 3s. 3d.; plump hens, 2s. 3d. to 3s.; ducks, 2s. 9d. to 4s.; geese, 5s. to 6s.; pigeons, 7½d. each; turkeys, from 9½d. to 10d. per lb. live weight for good to prime table birds; fair quality, 8d. to 9d. per lb.

POTATOES AND ONIONS.—The Adelaide market has been almost wholly supplied from the Ballarat district, and prices have advanced in sympathy with the rise in Victoria. ONIONS.—The market continues to rule steady, and apart from a few locally produced lines, our requirements have been imported from the Colac district of Victoria. Quotations:—Potatoes—Prime Snowflakes, £8 10s. to £9 per ton of 2,240lbs. on trucks Mile End or Port Adelaide. Onions—£5 10s. per ton of 2,240lbs. on trucks Mile End or Port Adelaide.

THE AGRICULTURAL OUTLOOK.

REPORT FOR MONTH OF JULY.

The following reports on the general agricultural condition and outlook of the areas represented by the Government Experimental Farms mentioned below have been prepared by the respective managers:—

Booborowie.—Weather—The weather has been very stormy and boisterous. The rainfall has been very good, but total fall has varied very considerably on adjoining farms. Crops—Seeding is finished. A fair quantity of wheat was sown late in June and early in July. The area in crop this year is hardly as large as last year. Natural feed has been going off; the extreme cold has stopped the growth. Stock is in fair condition, but the lambs in many cases are receiving a check. Pests—Foxes are numerous, and are doing much harm amongst some flocks. Miscellaneous—There is a general feeling that this year will be a good one. The rains, though late, are nice and steady.

Eyre's Peninsula.—Weather—The weather has been cold and wintry, interspersed with fine sunny days. Good rains have been registered; over 3½in. for the month, as against 2½in. for July, 1915. A few slight frosts and heavy fogs were recorded. Crops are making good use of the splendid weather conditions, and though naturally irregular in growth on the new land, are covering the ground well, and have a very healthy appearance. Natural Feed—Geraniums and small native grasses are showing thickly, but short; the tufts of the spear grasses provide stock with a fair picking of green. Stock—One case of strangles has broken out, otherwise stock are very healthy. Miscellaneous—All concrete tanks of the district are now full and overflowing. Clearing operations are in full swing on most occupied sections.

Kybybolite.—Weather conditions have been mild and calm generally, no particularly windy or cold weather being experienced. The 259 points of rain for the month to date is a comparatively light fall. Crops are making very satisfactory growth, and show an unusually good color for this time of year, when, under average conditions, there is a great excess of moisture. Natural feed is making slow growth, and, of course, is improving in quality as it matures. Stock generally are in very fair order and healthy. Autumn lambs have been marked, and the percentages range from 85 to 93 on the different holdings. Miscellaneous—Fallowing has not yet been commenced, except in a very few instances.

Turretfield.—Weather—The weather during the month of July was, on the whole, seasonable. The rainfall recorded was just 2in., distributed well over the period; no single fall being over ½in. Three heavy and two light frosts were experienced. On the night of the 17th a very heavy wind blew with hurricane force, but beyond the unroofing of a few sheds and uprooting a number of trees no serious damage resulted. All crops are making good headway, and are showing a fine, healthy color. Early-sown fields have a larger proportion of weeds than those sown later. Natural feed is becoming plentiful, but is not nearly of so rank a growth as last season. Stock are healthy and looking well. The lambs are growing rapidly. Pests—Foxes, though fairly numerous, are not causing any casualties amongst the lambs. Sparrows and starlings are very much in evidence, but at the present season of the year can do no harm. Rabbits are scarce. Miscellaneous—Fallowing has become general, and farmers are pushing on with this work as rapidly as circumstances will permit. The soil is now so sodden that even light rains bring down the North Para in flood. Land slips on the banks are numerous, while many old gum trees along the course of the river are being washed out. Some damage has also been done to fences through the floods.

Veitch.—Weather—A splendid month for rain in this district has been experienced. The gauge registered 241 points up to date (the 28th)—average for month, 98 points. Between rains we have had a few fine days followed by very cold nights. Crops—All crops in the district sown reasonably early are making splendid growth, and look promising. Crops sown on fallowed ground are showing to advantage. Natural feed is germinating well, barley grass especially. Stock are all in good healthy condition. Miscellaneous—Fallowing operations are going ahead well.

RAINFALL TABLE.

The following figures, from data supplied by the Commonwealth Meteorological Department, show the rainfall for the month of and to the end of July, 1916, also the average precipitation to the end of July, and the average annual rainfall.

Station.	For July, 1916.	To end July, 1916.	Av'ge. to end July	Av'ge. Annual Rainfall
Far North and Upper North.				
Oodnadatta	0·42	5·75	3·20	4·76
Tarcoola	1·78	2·94	4·26	7·58
Hergott	1·47	2·42	3·75	6·04
Farina	2·06	3·71	4·20	6·70
Leigh's Creek ...	2·21	3·39	5·39	8·66
Beltana	2·24	4·25	5·67	9·22
Blinman	3·73	7·07	8·09	12·83
Hookina	4·44	9·68	—	—
Hawker	5·88	10·23	7·14	12·22
Wilson.....	6·79	10·24	7·07	11·78
Gordon	4·77	7·59	5·89	10·26
Quorn	6·15	10·61	7·90	13·78
Port Augusta ...	2·36	5·42	5·59	9·46
Port Augusta W.	2·52	5·33	5·30	9·36
Bruce	3·63	6·44	5·78	10·01
Hammond	3·36	6·67	6·51	11·46
Wilmington	5·36	12·24	10·64	18·26
Willowie	3·46	7·57	6·90	11·90
Melrose	7·96	17·35	13·86	23·04
Booleroo Centre..	4·27	9·78	9·01	15·83
Port Germein ...	2·07	6·32	7·52	12·84
Wirrabara.....	6·14	14·94	11·09	18·91
Appila	4·37	8·55	8·55	15·08
Cradock	3·78	6·56	6·36	10·86
Carrieton	4·36	8·85	6·94	12·22
Johnburg	3·04	6·15	5·64	10·21
Eurelia	3·77	8·49	7·42	13·24
Orroroo	4·01	9·20	7·89	13·42
Black Rock	3·42	8·25	7·05	12·25
Petersburg	3·49	8·21	7·25	13·07
Yongala	3·84	9·52	7·59	13·94
North-East.				
Ucolta	3·80	6·89	—	—
Nackara	3·65	6·11	—	—
Yunta	2,11	4,13	4,79	8·22
Waukaringa	2·67	4·82	4·65	7·94
Mannahill	2·85	4·96	4·86	8·46
Cockburn	3·24	5·52	4·87	7·97
Broken Hill, NSW	3·06	4·69	5·73	9·63
Lower North.				
Port Pirie	2·97	8·23	8·88	13·21
Port Broughton .	4·91	11·25	8·61	14·33
Bute	4·25	11·41	9·36	15·42
Laura	4·57	11·84	10·34	18·22
Caltowie	3·06	9·82	9·48	17·27
Jamestown	3·80	11·10	9·62	17·46
Gladstone	3·31	9·21	8·96	16·00
Crystal Brook ...	4·29	10·43	8·97	15·62
Georgetown	3·93	11·85	10·53	18·32
Narridy	2·84	8·95	8·63	16·79
Redhill	3·91	11·42	10·85	16·79

Station.	For July, 1916.	To end July, 1916.	Av'ge. to end July.	Av'ge. Annual Rainfall
Lower North—*continued.*				
Spalding	3·98	13·17	11·10	20·25
Gulnare	3·43	12·31	10·94	19·74
BundaleerW.Wks.	3·06	12·41	9·39	17·29
Yacka	2·39	9·87	8·77	15·27
Koolunga	2·67	10·14	9·27	15·94
Snowtown.....	3·81	11·93	9·25	15·70
Brinkworth	2·40	11·02	8·87	15·48
Blyth.....	2·56	11·01	9·58	16·34
Clare	4·00	17·26	14·24	24·30
Mintaro Central .	4·16	16·76	12·36	21·99
Watervale.....	4·30	17·61	15·69	27·17
Auburn	2·85	13·33	14·16	24·25
Hoyleton	1·97	9·00	10·46	17·96
Balaklava	2·04	8·04	9·38	16·03
Port Wakefield ..	3·17	9·19	8·19	13·73
Terowie	2·72	6·97	8·47	13·71
Yarcowie	2·70	8·28	7·80	13·91
Hallett	2·87	8·52	9·01	16·40
Mount Bryan ...	3·99	12·52	8·84	15·73
Burra	4·95	13·73	10·27	17·82
Farrell's Flat	2·93	—	10·86	18·87
West of Murray Range.				
Manoora	3·18	11·40	10·13	18·09
Saddleworth	2·28	10·24	11·49	19·69
Marrabel	4·46	14·37	10·81	18·94
Riverton	2·78	14·64	11·84	20·48
Tarlee	2·09	11·46	9·96	17·48
Stockport	2·06	12·21	9·01	15·89
Hamley Bridge ..	1·99	11·43	9·51	16·45
Kapunda	3·45	14·18	11·38	19·67
Freeling	2·65	13·36	10·16	17·85
Greenock	4·55	17·72	12·03	21·46
Truro.....	3·64	14·52	11·20	19·74
Stockwell	3·80	14·60	11·48	20·30
Nuriootpa	3·24	15·78	12·08	21·25
Angaston	4·34	17·03	12·60	22·25
Tanunda	3·13	16·08	12·91	22·28
Lyndoch	2·57	13·97	13·46	23·01
Adelaide Plains.				
Mallala	1·99	9·74	9·91	16·88
Roseworthy	2·11	11·08	10·05	17·31
Gawler	2·49	14·18	11·36	19·21
Two Wells	2·05	10·88	9·97	16·36
Virginia.....	2·35	11·73	10·52	17·58
Smithfield	1·84	12·17	10·13	17·30
Salisbury	2·33	13·64	11·17	18·57
North Adelaide ..	4·09	18·41	12·96	21·49
Adelaide	3·30	16·05	12·76	21·04
Brighton	2·91	15·50	12·01	19·93
Glenelg	2·88	13·84	11·20	18·35

RAINFALL—continued.

Station.	For July, 1916.	To end July, 1916.	Av'ge. to end July.	Av'ge. Annual Rainfall.
ADELAIDE PLAINS—*continued.*				
Magill	2·41	14·83	16·79	25·69
Glen Osmond	3·53	19·96	15·34	25·26
Mitcham	3·12	17·45	14·37	23·47
Belair	3·55	8·10	17·65	28·64
MOUNT LOFTY RANGES.				
Teatree Gully	3·74	18·19	17·11	28·19
Stirling West	6·14	31·85	28·07	46·70
Uraidla	6·26	31·45	26·88	44·35
Clarendon	4·38	22·80	20·24	33·67
Morphett Vale	3·16	15·81	14·04	23·32
Noarlunga	3·49	13·76	12·42	20·28
Willunga	4·02	17·88	15·80	25·98
Aldinga	3·12	13·86	12·44	20·34
Normanville	4·25	16·53	12·83	20·65
Yankalilla	5·21	18·90	14·45	22·78
Cape Jervis	2·57	10·73	10·41	16·34
Mount Pleasant	5·30	19·04	15·84	26·87
Blumberg	4·73	20·04	17·45	29·38
Gumeracha	5·03	21·70	19·45	33·30
Lobethal	6·40	25·41	20·93	35·38
Woodside	4·98	19·55	18·56	31·87
Hahndorf	5·16	19·65	20·64	35·45
Nairne	4·20	15·53	16·95	28·83
Mount Barker	4·45	19·85	18·13	30·93
Echunga	4·28	20·13	19·58	32·83
Macclesfield	4·83	19·09	17·76	30·72
Meadows	5·97	24·58	20·90	35·52
Strathalbyn	3·10	12·10	11·40	19·28
MURRAY FLATS AND VALLEY.				
Wellington	1·85	8·01	8·70	15·01
Milang	1·95	7·32	9·86	16·08
Langhorne's Brdg	1·68	7·23	8·89	15·27
Tailem Bend	1·83	8·10	—	—
Murray Bridge	1·59	6·74	8·36	14·32
Callington	2·47	8·24	9·16	15·65
Mannum	2·42	5·75	7·00	11·67
Palmer	2·56	8·64	8·73	15·00
Sedan	2·46	7·07	6·97	11·92
Blanchetown	1·27	3·34	6·20	10·71
Eudunda	4·10	11·56	9·88	17·33
Sutherlands	2·59	7·09	5·92	10·60
Morgan	2·23	4·10	5·08	9·29
Overland Corner	1·52	3·47	6·36	11·42
Renmark	1·85	4·39	6·76	10·93
Loxton	2·19	6·27	—	—
WEST OF SPENCER'S GULF.				
Eucla	2·45	5·89	6·64	10·13
White Well	3·28	8·37	5·58	9·67
Fowler's Bay	4·36	9·73	8·15	12·11
Penong	6·44	12·84	7·70	11·93
Murat Bay	3·07	8·36	—	—
Smoky Bay	3·46	8·87	—	—

Station.	For July, 1916.	To end July, 1916.	Av'ge. to end July.	Av'ge. Annual Rainfall.
WEST OF SPENCER'S GULF—*continued.*				
Streaky Bay	3·66	10·60	9·99	15·31
Port Elliston	3·11	12·77	10·63	16·49
Port Lincoln	4·80	15·95	12·42	19·88
Tumby	3·74	10·43	9·20	15·00
Carrow	4·09	10·47	—	—
Cowell	2·45	5·76	7·05	11·76
Point Lowly	3·07	6·54	6·93	12·21
YORKE'S PENINSULA.				
Wallaroo	3·83	10·80	8·83	14·05
Kadina	4·47	12·08	9·95	15·88
Moonta	4·26	12·40	9·65	15·22
Green's Plains	3·38	10·65	9·58	15·73
Maitland	5·82	17·52	12·30	20·08
Ardrossan	3·73	10·87	8·40	13·89
Port Victoria	3·73	12·91	9·49	15·20
Curramulka	4·02	13·24	11·13	18·51
Minlaton	4·81	14·96	10·56	17·41
Stansbury	3·24	11·30	10·31	17·06
Warooka	3·93	13·06	10·90	17·71
Yorketown	2·97	12·79	10·53	17·47
Edithburgh	3·56	13·19	10·10	16·48
SOUTH AND SOUTH-EAST.				
Cape Borda	5·48	16·98	16·44	25·09
Kingscote	5·10	14·72	11·94	18·95
Penneshaw	3·82	14·06	13·44	21·24
Cape Willoughby	4·71	17·10	11·91	19·09
Victor Harbor	2·83	11·58	13·57	22·18
Port Elliot	2·88	10·59	12·26	20·33
Goolwa	2·99	11·92	10·85	17·93
Pinnaroo	2·47	7·97	9·29	16·74
Parilla	2·59	9·96	—	—
Lameroo	2·78	9·88	9·19	16·55
Parrakie	2·09	7·82	—	—
Geranium	2·84	9·71	—	—
Peake	2·49	9·63	—	—
Cooke's Plains	1·90	10·06	8·45	14·74
Meningie	2·13	13·45	11·28	18·87
Coomandook	2·92	11·40	—	17·49
Coonalpyn	2·62	11·25	10·16	16·80
Tintinarra	2·91	11·31	10·84	18·78
Keith	2·56	10·46	—	—
Bordertown	2·06	10·26	11·09	19·76
Wolseley	1·75	10·10	9·98	17·72
Frances	2·40	9·58	11·31	20·74
Naracoorte	2·98	11·85	12·83	22·60
Penola	2·61	13·69	15·30	26·78
Lucindale	2·52	12·94	13·66	23·32
Kingston	3·69	14·56	15·22	24·73
Robe	4·03	20·08	15·41	24·69
Beachport	5·31	21·15	17·66	27·51
Millicent	3·85	20·69	18·02	29·25
Mount Gambier	3·67	17·17	18·50	32·00
C. Nrthumberland	3·43	15·75	16·06	26·63

THE AGRICULTURAL BUREAU.

CONFERENCE OF UPPER NORTHERN BRANCHES.

The Branches of the Agricultural Bureau constituting the Upper Northern District met in Conference at Orroroo on Friday, July 14th. The Minister of Agriculture (Hon. C. Goode, M.P.), the Horticultural Instructor (Mr. Geo. Quinn), Poultry Expert (Mr. D. F. Laurie), Messrs. F. Coleman (Chairman), G. Jeffrey, and H. J. Finnis (Acting Secretary of the Advisory Board of Agriculture), attended, and in addition a representative gathering of delegates.

Proceedings were opened by a pruning demonstration in the garden of Mr. J. Hagger, where the Horticultural Instructor gave a practical lesson in pruning grape vines and fruit trees, and explained at length the principles underlying the art of pruning.

The first session of the Conference was begun at 2 p.m., and was presided over by Mr. N. J. Neylon, who introduced the Minister of Agriculture, and called on the Minister to open the Conference.

Opening Address.

The Hon. C. Goode, M.P., expressed his pleasure at being present, and after referring to the value of the work being done by the Bureau, and the necessity for producers exercising every endeavor to secure from the land the greatest possible return, mentioned that if the man on the land were making a success of his operations, secondary industries also would feel the impetus, and there would be more general prosperity and room for a larger population. They could largely contribute in that direction by means of closer settlement, and the Government had, by a purchase of the Mount Remarkable Estate, assisted towards that end.

Aggregation of Holdings in the North.

A proposal had been put before the Government in regard to certain areas in the North, that they should take steps to secure an aggregation of holdings, in such a way as to enable one man, under easy terms, to buy out one or two of his neighbors, in order that he might eventually be in possession of sufficient land to enable him to secure a living from grazing. Under existing circumstances he was opposed to that, on the grounds that the scarcity of stock made it unwise, for whilst a man might be able to secure the land, he might not be able to secure the necessary stock. Hence, however desirable the suggested reform might be in the general way, that was a practical difficulty which made it inopportune at the present.

The question of the increase in the number of stock was of the utmost importance, and he intended having experiments conducted

with the idea of ascertaining whether they could, by artificially feeding, keep ewes in a condition fit for breeding for a much longer period than was generally the case at present. That was one direction in which they might be able to facilitate the increase in their flocks, and the possibilities were considerable, as he believed that it was recorded that an ewe had been utilised for breeding until she had reached an age of 25 years.

The Wheat Scheme.

The speaker traversed the history of the scheme adopted for the marketing of the 1915 harvest, and explained the reasons that prompted the Governments of the participating States in adopting it.

Bulk Handling of Wheat.

At the 1913 Congress of the Agricultural Bureau, he said, a resolution to the following effect had been passed by a large majority:—"That this Congress urge the Government to take such steps as may be necessary to make bulk handling of wheat the ordinary process of marketing in this State."

The Government had now taken steps to secure plans and specifications for a system of wheat elevators, and a Bill would be introduced into Parliament asking authority to have these elevators constructed. All the wheat-producing States were in line in that action, and that fact ensured the attraction of the right class of shipping to carry the grain.

Canada, Argentine, and the United States of America, had been shipping a great part of their wheat in bulk, and if it paid those countries it should pay Australia to do likewise. It had been urged that whilst those countries, with their large crops, could profitably handle their wheat in bulk, the smaller production of Australia would make the system unprofitable here, but the normal Australian crop in the future was going to be very much greater than that of the past. The large number of outports that they had in South Australia was certainly a difficulty, but by no means an insurmountable one. As a matter of fact, under the bag system of handling, South Australian wheat was selling at about 1d. per bushel lower than that of the other States, on account of the number of outports, and the extra handling involved, and under the bulk system there was no reason to believe that the difference would be any greater.

There was no doubt that the internal handling could be done in bulk; as a matter of fact, some farmers in the Commonwealth were to-day reaping their wheat, handling it in bulk in the paddocks, and then carrying it to the mills in bulk, thus dispensing altogether with the bags.

A Cleaner Sample.

The proposed scheme would encourage the production of a cleaner sample of grain. At the elevator the grain would be graded and paid for according to its quality. The freight on tons of screenings, &c., would thus be saved, and the stuff would remain in the Commonwealth to be used as stock food. There was no doubt as to the wisdom of adopting two grades for Australian wheat, and without the elevator system, that was impracticable.

Australian wheat generally sold at about 1½d. per bushel below the Manitoba grain. Whilst it was admitted that the American hard wheat had its special value on account of gluten content, against that was the fact that Australian grain was necessary on account of its color. With the adoption of the bulk handling, and the two grades, Australian No. 1 grade would be of the same weight per bushel from year to year, thus engendering confidence on the part of the buyers, and it could be reasonably assured that the Australian grain would command quite as much, if not more, than the highest grades of red wheat.

Saving the Cost of Bags.

The saving that would be effected in the direction of a reduction in the number of cornsacks required was very considerable, for on a 30,000,000bush. crop selling at 3s. 6d. per bushel, with bags at 9s. per dozen, the farmer's outgoings for bags represented £309,375, and with wheat at 2s. 6d. per bushel and bags at 7s. 6d per dozen, he had to lay out £265,625. He believed the time was coming when South Australia would produce 90,000,000bush. of wheat as easily as they could now produce 30,000,000bush.

Another important factor was that the damage to the wheat by weather, mice, and weevil could be very easily controlled with the wheat elevators, and the loss to the community would then be reduced to a minimum.

It was anticipated that even if freights were not reduced, there would certainly be no increase in the rates for wheat in bulk, as the very considerable reduction in the time necessary for loading the vessels would make it possible for shipowners to reduce their rates.

The so-called "free storage" would be superseded by a system that would be of considerable advantage to the wheatgrower. The elevators would be under the control of the Government, and the grower, on delivering his grain, would receive a certificate for the amount of wheat of the particular grade that he delivered. That certificate would be a negotiable instrument; it could be sold outright, or, if the farmer so preferred, he could hold it in anticipation

of a rise in the market price, at the same time securing an advance against it from the bank.

More Labor for the Farmer.

Labor which was under the present system employed in shipping operations, and in handling the bagged wheat in the country, could be released, and made available for the farmers. The large profits which were being made by the grain merchants would be distributed more widely, and a greater proportion would go to the farmer.

A Pleasing Duty.

The Hon. Minister, at the request of the Chairman, presented to Mr. T. H. P. Tappscott, a certificate of life membership of the Agricultural Bureau. Mr. Tappscott has been a member of the organisation for a period of over 22 years, and during that time had rendered signal service to the Orroroo Branch, of which he was Hon. Secretary for some years.

POISONING FOXES.

In a short paper, Mr. Noll, of the Quorn Branch, expressed the opinion that poisoning would readily get rid of foxes. The method of effecting their destruction which he advocated, was to shoot or otherwise secure birds, preferably ring-necked parrots, and whilst they were still warm, put into the mouth of each as much strychnine as would lie on the small blade of an ordinary pocketknife. On no account should the bird be touched with the human hand—plyers should be used. Some strong-smelling animal matter should be dragged around the fowlhouse or sheep pens which the foxes visited, at a distance of a quarter of a mile. That should be done about sunset, and a bait should be dropped at intervals along the trail. The use of birds as baits lessened the danger of poisoning domestic dogs. Mr. Key, of the Carricton Branch, in discussing the paper, said the practice outlined had proved successful in dealing with foxes, but the wild dog was more wary and difficult to poison.

SHEEP AND WOOL FOR THE FARMER.

"A few years ago it was a general practice not to use either rams or ewes for breeding purposes until they were four-tooth," said Mr. J. F. Burns, of the Wepowie Branch. However, of late it was not uncommon to breed from two-tooth ewes and lambs, and fairly satisfactory results had followed except in the cold, wet districts. Whilst the younger ewes were admittedly inferior mothers, if they were given a sufficiency of food and water, and care and attention, the results justified their use as breeders. The writer of the paper des-

cribed the points of the Merino ram, and gave a number of points in regard to the general management of the farm flock.

Mr. Geo. Jeffrey (member Advisory Board), in commenting on the paper, said that generally speaking the Merino ram would be found the most useful in that district. Careful consideration should be given to the quality of the ewes. The Merino best suited to their conditions was the big-framed sheep, as constitution was of the utmost importance. That would be found generally to accompany the bolder wool. In regard to the suggestion that steps should be taken to prevent the slaughter of female stock, they should recognise that in some cases, and on some of the holdings, it was necessary for the owners to dispose of their sheep immediately they got them fat, irrespective of whether they were ewes or wethers. The use of two-tooth ewes for breeding was a wise practice to resort to under present conditions.

Mr. Brice (Orroroo) had tried the English breeds, and they had done well.

Mr. F. Coleman (Chairman Advisory Board) agreed that this was a Merino district, but suggested that owners might with advantage try the English breeds, particularly the Leicester, which crossed with the Merino, produced a good market lamb.

HORTICULTURE.

The Horticultural Instructor (Mr. Geo. Quinn) then addressed the gathering on the subjects of planting fruit trees, the prevention of codlin moth, and the treatment of scale on citrus trees. At the close of his address Mr. Quinn answered a number of inquiries.

THRESHING.

Mr. J. E. Pearce, of the Wepowie Branch, contributed a paper, in which he pointed out the benefit the farmer secured in the way of a reserve of fodder by threshing part of the crop, and stacking the straw. Barley particularly could be most advantageously treated in that manner.

POULTRY.

The evening session, which was particularly well attended, was devoted principally to the question of the poultry industry, the Poultry Expert (Mr. D. F. Laurie) addressing the gathering.

NEXT CONFERENCE.

It was decided that the next Conference should be held at Quorn.

The Conference closed, after votes of thanks to the Minister of Agriculture and visiting officers and delegates, with the singing of the National Anthem.

AGRICULTURAL BUREAU REPORTS.

INDEX TO CURRENT ISSUE AND DATES OF MEETINGS.

Branch.	Report on Page	Dates of Meetings. Aug.	Sept.
Amyton	†	—	—
Angaston	‡	—	—
Appila-Yarrowie	*	—	—
Arden Vale & Wyacca	*	—	—
Arthurton	*	—	—
Balaklava	*	12	9
Beaufort	58	—	—
Beetaloo Valley	*	—	—
Behlie North	†	—	—
Berri	*	16	13
Blackwood	77	—	—
Blyth	60	—	—
Bookpurnong East	72	—	—
Booleroo Centre	59	—	—
Borrika	‡	—	—
Bowhill	*	—	—
Brentwood	*	10	7
Brinkley	*	12	—
Bundaleer Springs	‡	—	—
Burra	*	—	—
Bute	60	—	—
Butler	*	—	—
Caltowie	*	—	—
Canowie Belt	59	—	—
Carrieton	57	—	—
Carrow	66	—	—
Cherry Gardens	77	8	12
Clanfield	‡	—	—
Clare	*	—	—
Clarendon	*	—	—
Claypan Bore	‡	7	11
Colton	*	—	—
Coomandook	†	—	—
Coomooroo	*	—	—
Coonalpyn	66	—	—
Coonawarra	*	—	—
Coorabie	61-66	—	—
Cradock	‡	—	—
Crystal Brook	*	—	—
Cummins	‡	—	—
Cygnet River	*	10	7
Davenport	*	—	—
Dawson	*	—	—
Denial Bay	*	—	—
Dowlingville	61	—	—
Elbow Hill	62	—	—
Forest Range	*	—	—
Forster	67	—	—
Frances	*	—	—
Freeling	*	—	—
Gawler River	*	—	—
Georgetown	*	—	—
Geranium	67	26	30
Gladstone	‡	—	—
Glencoe	*	—	—
Glencope	*	—	—
Goode	‡	—	—
Green Patch	‡	—	—
Gumeracha	*	—	—
Halidon	67	9	13
Hartley	†	9	6
Hawker	*	15	12
Hilltown	*	—	—
Hookina	*	8	12
Inman Valley	†	8	5
Ironbank	77	12	9
Julia	‡	—	—
Kadina	*	—	—
Kalangadoo	*	12	9
Kanmantoo	73	12	9
Keith	*	—	—
Ki Ki	*	—	—
Kingscote	*	—	—
Kingston-on-Murray	*	—	—
Koonibba	66	8	5
Koppio	62	—	—
Kybybolite	77	10	7
Lameroo	*	—	—
Laura	*	—	—
Leighton	‡	—	—
Longwood	‡	—	—
Loxton	†	—	—
Lucindale	†	—	—
Lyndoch	†	10	—
MacGillivray	*	—	—
Maitland	†	—	—
Mallala	‡	14	11
Mangalo	*	—	—
Mantung	†	—	—
Meadows South	*	8	12
Meningie	*	—	—
Milang	75	13	10
Millicent	†	8	12
Miltalie	63	12	9
Mindarie	‡	7	4
Minlaton	†	11	8
Mintaro	†	12	9
Mitchell	*	—	—

INDEX TO AGRICULTURAL BUREAU REPORTS—*continued.*

Branch.	Report on Page	Dates of Meetings. Aug.	Sept.	Branch.	Report on Page	Dates of Meetings. Aug.	Sept.
Monarto South	68	—	—	Redhill	‡	8	5
Monteith	*	—	—	Renmark	†	—	—
Moonta	61	—	—	Riverton	59	—	—
Moorlands	*	—	—	Roberts and Verran	65	8	12
Morchard	*	12	9	Rosenthal	60	14	13
Morgan	†	12	—	Rosy Pine	‡	9	6
Morphett Vale	†	—	—	Saddleworth	*	—	—
Mount Barker	74	9	6	Salisbury	60	—	—
Mount Bryan	‡	—	—	Salt Creek	66	—	—
Mount Bryan East	57	—	—	Sandalwood	80	—	—
Mount Compass	*	—	—	Sherlock	73	—	—
Mount Gambier	78	—	—	Spalding	*	22	17
Mount Hope	66	—	—	Stirling's Well	73	—	—
Mount Pleasant	*	—	—	Stockport	*	—	—
Mount Remarkable	†	2, 30	—	Strathalbyn	77	8	12
Mundoora	*	—	—	Sutherlands	*	—	—
Murray Bridge	69	14	11	Tantanoola	*	—	—
Mypolonga	73	9	13	Tarcowie	*	8	12
Myponga	77	—	—	Tatiara	*	5	2
Myrla	*	—	—	Tintinarra	*	—	—
McNamara Bore	‡	—	—	Two Wells	‡	—	—
Nantawarra	60	—	—	Uraidla and Summert'n	*	7	4
Naracoorte	‡	—	—	Waikerie	‡	—	—
Narridy	*	—	—	Warcowie	56	—	—
Narrung	76	—	—	Warrow	65	—	—
Netherton	*	—	—	Watervale	60	—	—
North Booborowie	58	—	—	Wepowie	‡	—	—
North Bundaleer	*	—	—	Whyte-Yarcowie	‡	—	—
Northfield	‡	1	5	Wilkawatt	*	—	—
Orroroo	57	—	—	Willowie	56	7	12
Parilla	*	10	7	Wilmington	†	—	—
Parilla Well	‡	—	—	Wirrabara	‡	—	—
Parrakie	72	5	2	Wirrega	80	—	—
Paskeville	*	—	—	Wollowa	73	—	—
Penola	*	—	—	Woodleigh	73	14	11
Penong	63	12	9	Woodside	†	—	—
Petina	*	—	—	Wynarka	72	—	—
Pine Forest	*	—	—	Yabmana	‡	—	—
Pinnaroo	‡	—	—	Yacka	*	—	—
Pompoota	73	3,17,31	14, 28	Yadnarie	*	—	—
Port Broughton	58–9	—	—	Yallunda	*	—	—
Port Elliot	76	19	16	Yaninee	‡	—	—
Port Germein	*	19	16	Yeelanna	65	—	—
Port Pirie	*	12	9	Yongala Vale	‡	7	11
Quorn	†	12	9	Yorketown	*	—	—
Ramco	†	—	—				

* No report received during the month of July. † Formal report only received.
‡ Held over until next month.

ADVISORY BOARD OF AGRICULTURE.

Dates of Meetings—
August 9th and September 13th, 1916.

[A large number of Branches have, during the past month, held their annual meetings, and, as a general rule, where the only business transacted has been the presentation of the Hon. Secretary's report and the election of officers, these meetings will be recorded in the index as "Formal report only received."—Ed.]

THE AGRICULTURAL BUREAU OF SOUTH AUSTRALIA.

Every producer should be a member of the Agricultural Bureau. A postcard to the Department of Agriculture will bring information as to the name and address of the secretary of the nearest Branch.

If the nearest Branch is too far from the reader's home, the opportunity occurs to form a new one. Write to the department for fuller particulars concerning the work of this institution.

REPORTS OF BUREAU MEETINGS.

UPPER-NORTH DISTRICT.
(PETERSBURG AND NORTHWARD.)

WARCOWIE (Average annual rainfall, 12.16in.).

June 10th.—Present: nine members.

UPKEEP OF THE FARMING PLANT.—Mr. W. J. Saunders contributed a paper on the upkeep of the farming plant, advocating that machinery and implements should be kept under cover, as protection against the weather, and painted every other year. Wheels should be painted every year. It was a mistake to use wire as a substitute for a bolt because it might cause a working in the joint. Every farmer should have a forge. Tireing should be done about the middle or end of summer, when the wood was thoroughly dry, as that tended to keep tires tight for a much longer period. Harness should be kept in thorough repair and oiled or greased twice a year. Mr. J. Feindler suggested the provision of a metal trough, made to suit the shape of the wheel, and it should be filled with oil covering the felloes and the ends of the spokes. The trough should be raised slightly off the ground, and a fire lighted under it to heat the oil. By turning the wheel occasionally and brushing the oil around the nave, the wood became thoroughly saturated with oil, which was an excellent preservative. Mr. G. Growden said that he had not found the oiling of wheels a success. He preferred a coat of good paint. Neatsfoot oil and mutton fat formed an excellent harness dressing, but if the oil were inferior in quality the leather would crack. Mr. T. Donnellan had observed good results from applying equal parts of mutton fat and Stockholm tar to harness. It gave an excellent finish, penetrated well, and did not rub off on the clothes. It was an effective dressing for riding saddles.

WILLOWIE (Average annual rainfall, 11.90in.).

July 11th.—Present: eight members.

TREE PLANTING.—Beautifying farms and homesteads by planting ornamental trees suitable to the district was the theme of a paper by Mr. E. C. Foulis, who stated that the native trees of the district were becoming old and were fast deteriorating. There were no young trees to take their places, and substitutes should be found, not only to provide shelter for stock, but to maintain the supply of firewood and preserve the natural appearance of the country. Every vacant piece of land which could be spared should be planted with trees. In the driest of districts trees could be grown with success if the ground were thoroughly worked before being planted. It should be ploughed to a depth of 6in. several months before planting, and just before the trees were put in the soil should be again ploughed to a depth of 10in. or 12in., which would render it nice and mellow and save considerable labor in digging holes. After ploughing drains should be made to each tree in order that when rain fell it would be directed to the trees. The best time for planting was June or July, or even earlier if the trees were available.

If planting were deferred until August or September there was the danger of the caterpillars destroying the young plants before they became thoroughly rooted. The trees should not be planted too closely together—there should be a space of 18ft. or 20ft. between them. To produce a robust tree it was necessary that it should thrive well while young. Trees should not be planted near buildings or underground tanks, because the roots were liable to penetrate the stonework and do irreparable damage. The trees which had thriven best and were most suitable in that district were the pepper and sugar gum; but others which had done well were the tamarisk, pine and carob. The last-named was an exceptionally slow grower, but threw out very close, dense foliage which, when fully developed, afforded effective shelter for stock. Besides being adapted for ornamental hedges it produced a bean, which was useful as food for stock. Lucerne and olive trees should repay handsomely the trouble of planting.

SPARE TIME ON THE FARM.—On wet days, when the team was not able to work, said Mr. J. H. McCallum in a paper dealing with the methods in which a farmer might employ his spare time in winter and on wet days, the harness might be overhauled and given a coat of neatsfoot or some other good harness oil, but he preferred the former, especially if warmed before using. The repairing of chains should also receive attention. Wooden swingletrees were continually getting out of order, and it was a useful contrivance to make iron swingletrees out of old plough beams. That could be effected by putting three links in at the width required. The seed wheat bags should be patched—work which avoided delay at harvest time. Some farmers paid harvest wages for the mending of bags, when it might be done very much more cheaply beforehand. The bags should be stored in a mouse-proof bin, or they might be suspended on rails hanging from the roof of the barn, by wires passed through the neck of a bottle with a cork in it, which proved an effective block. The rail arrangement would be found convenient in overhauling the bags. The cleansing of stables and yards should be attended to as well as their drainage. A scoop would be found very useful in that work, and if the soil were taken out to ploughing depth in some places, great advantage might be gained. A few loads of stone would also be helpful. Plough and cultivator shares might be sharpened, and if the shares were chilled very hard their life would be almost doubled. There were always small matters which required attention in connection with the machinery. Mr. A. Gray said that the soil should be loosened very deeply for tree plantation, but should not be turned up with a mouldboard.

CARRIETON, June 15th.—Mr. F. Kaerger read a paper on "Smut in Wheat," and the Chairman (Mr. W. T. Brown) read a paper on "Sheep on the Farm."

ORROROO, June 17th.—Mr. G. Graham read a paper entitled "Does it pay to market dirty or unsound wheat?" and pointed out that wheat price could not be expected for wheat and rubbish. Supplying inferior wheat would bring the home market down, and it involved also a loss in bags, because more bags were required if rubbish were marketed with the wheat. Inferior grain was frequently marketed because the crop was harvested before it was properly ripe, with the result that the inside of the grain became soddened, a condition inimical to the production of the highest class of flour. Smut also depreciated the wheat value.

MIDDLE-NORTH DISTRICT.

(PETERSBURG TO FARRELL'S FLAT.)

MOUNT BRYAN EAST (Average annual rainfall, 16in.).

June 10th.—Present: five members.

SEEDING AND FALLOW.—A paper on seeding and fallow was read by Mr. J. Doyle, who recommended seeding in April, even if the rain held off. Farmers having a large area to sow, if they waited for the rain, and it kept off until May, were hampered for several days by the heavy ground. He recommended pickling wheat three days before sowing, and then there would be no danger of malting, unless the rain was very late. Farmers who had sown before the rain had reaped 30bush.

per acre. He recommended Federation for grain and Yandilla King or Dart's Imperial for hay. Fallowing should be started in June, and should be finished in August. The land so treated should then be cultivated in the spring, and if one cultivation did not kill the weeds it paid to go over it a second time. Farmers should fallow just as large an area as they could work and keep clean.

NORTH BOOBOROWIE (Average annual rainfall, 16.35in.).

June 7th.—Present: seven members and eight visitors.

BREEDING OF DRAUGHT HORSES.—Every farmer should breed his own stock, was the opinion expressed by Mr. E. J. Dunstan, in a paper on "The Breeding of Draught Stock," because, he said, with his intimate knowledge of the mares on his farm, he should be able, with reasonable judgment, to produce exactly the class of animal required. Shapeliness, size, good clean bone, muscle, and fine silky hair were some of the main points in a good animal, which should measure bigger than it looked, and weigh more than one would be inclined to think. The action was important, and the aim should be to produce a team even in pace, and the faster, in reason, the better. Intelligence and temper were important points which should be well studied. The most suitable horse for that district was the Clydesdale. Big-looking slab-sided mares were not desirable animals from which to breed, because they almost invariably produced foals with soft muscles and poor constitutions. It was also unwise to breed from vicious and sulky mares or stallions. Should the mare be weak in any characteristic, the stallion selected should be strong in that quality, so as to lessen the chance of the dam's weakness being reproduced in the progeny. In choosing a stallion it should be remembered that it paid to have the very best, even though the service fee were three or four times more than that of a lower class animal. The foals should be weaned when five months old. At that period it was able to feed out of a manger, and, if cared for, would do quite as well as when sucking the mare, on which it would be big enough to be a severe strain. Castration should take place in the spring, when the colt was two years old, and six months later it should be fit for work.

PORT BROUGHTON (Average annual rainfall, 14.44in.).

May 19th.—Present: seven members.

LAMB RAISING IN CONJUNCTION WITH FARMING.—In providing sheep for the farm, observed Mr. T. E. Pattingale, in a paper on farming, the first essential was to ascertain the class of sheep best suited to the district. The next consideration was whether they were to be disposed of as mutton, kept for their wool yield, or for sale in the wool. The breed of ewe most suitable for that district was the Merino. Breeding for wool enabled the farmer to keep more sheep than if the sheep were fattened for the meat market. He had tried the Shropshire-Merino cross without much success. The wool yield of the Merino surpassed that of the Shropshire, his returns showing 5s. 5½d. per head for the former, as against 3s. 9d. per head for the latter, an advantage of 1s. 8½d. per head in favor of the Merino. As a rule only 30 per cent. of the lambs could be properly fattened, leaving 70 per cent. of the lambs on hand, a result which, if the lambs were crossbreds, was most undesirable. Mr. J. H. Fletcher preferred the pure Merino dam to the crossbred dam, though the latter produced a better lamb; but there was a great difficulty in maintaining the cross, and the wool returns were less favorable. He preferred the Shropshire-Merino cross for mutton production, because they were readily fattened and were not bad "fencers." Mr. C. E. Pattingale said that eight-wire fences were required for crossbred sheep.

BEAUFORT, June 15th.—Discussion took place as to the best gate to use on a farm. Mr. J. Sampson preferred the iron gate in one piece, because the two-piece gates were troublesome to shut. Mr. W. W. Mugford said that as the implements now manufactured were so wide, it was necessary that the gates should be in two pieces, in order to accommodate them. Mr. A. Yard (Chairman) favored the double gate as the cheapest, and recommended that it should be swung to the straining post, which would ensure firmness. Mr. W. C. Veitch preferred the double gate, with each piece 7ft. wide. In reply to a question whether chaff with plenty of corn in it, or hay cut green without corn, was the better for a working horse, Mr. Sampson said that the horses preferred the feed with the corn in it.

BOOLEROO CENTRE, June 16th.—Mr. R. Mitchell, Chief Chemist of the Wallaroo and Mount Lyell Fertilisers, Limited, read a very interesting paper on "Superphosphate and its Relation to the Soil." Animated discussion followed, and Mr. Mitchell answered, in an illuminating manner, a number of questions.

CANOWIE BELT, July 15th.—In a paper dealing with fallowing, Mr. L. Kitschke said that the plough should be set so that every share would cut to an even depth, otherwise the ground was rendered ridgy. If the shares were set too wide, it made the ground lumpy and rough. The direction of the ploughing round the farm should be varied each year, to prevent the formation of ridges round the fence. He advised the burning of stubble, because the heat destroyed a certain amount of weeds and seeds. Fallow should be harrowed immediately after ploughing. If wet ground were ploughed, it became very hard in the spring. It was well to roll fallow before the cultivator was taken out. The cultivator should be worked crosswise to level ridges, and the depth should be from 3½in. to 4in. He preferred the disc cultivator, and would use it in September. A few sheep should be run on the fallow, but horses and cattle should not be turned into it in wet weather. Mr. Kirk advocated the use of harrows behind the cultivator.

PORT BROUGHTON, June 23rd.—Discussion took place on fallowing, the trend of opinion being in favor of early fallow.

LOWER-NORTH DISTRICT.

(ADELAIDE TO FARRELL'S FLAT.)

RIVERTON (Average annual rainfall, 20.48in.).

June 17th.—Present: 13 members and three visitors.

FALLOWING.—As a preface to a paper on fallowing, Mr. H. Mills advised farmers to have their harness well oiled or greased before commencing operations, in order to keep out the winter's rain. He expressed the opinion that fallowing should be commenced as soon as seeding had been finished whilst the horses were in good heart. Early fallowing was the best. He recommended ploughing to a depth of from 2in. to 4in., and considered 3in. a good depth, but it might be better to plough deeper every six or seven years. He was averse to ploughing in the weeds too deeply. It was inadvisable to plough the ground when it was too wet, especially red soil, as it became too hard to work up properly. Ploughing in black ground should be shallow in depth, otherwise the soil would become too loose for the seed-bed, which should be compact. As much straw as possible should be ploughed in, as that provided organic matter for the following year's crop. It was, however, difficult to plough in straw, as the plough would not go through it, though occasionally the disc plough could be successfully utilised for that purpose. He preferred to put sheep on the fallow rather than cultivate it so much, as they helped to make it firmer for the ensuing crop. The end of August or September was a good time to harrow the fallow, but that should not be attempted if the ground were too wet, or cultivation would be much more difficult. After being well harrowed, the land should be cultivated, but not too deeply, or the seed bed would be injured for the following year. Sometimes it was necessary to use the cultivators twice, but the cultivator harrows might very often be used instead of the cultivator the second time, as they left the ground less open. Either the cultivator harrows or the scarifying harrows should be run over the ground just before harvest, to destroy stinkwort. After every rain, the light harrows should be put over the fallow, for it was of little use working it when the soil was too dry. Harrowing kept the moisture in the ground. With early rains the harrows should be used in order to start the weeds before seeding. He recommended summer fallowing where there was a large area of black soil which became sticky in the winter, but which could be ploughed very well in summer. The ploughing could be done soon after harvest, when the weather was not too hot to work the teams. The disc plough was splendid for summer work. With summer fallowing it was best to cultivate as soon after seeding as possible, when the ground was not too wet. Where the soil was loose the fallow should be cultivated with narrow shares, and the broad shares should be put over it afterwards, though in some circumstances it

was well to use the narrow shares twice. Cultivator harrows were very useful to destroy weeds at the latter part of the year. Whilst it would be found most advantageous in a dry year to work with the cultivator only, to omit the ploughing for two years in succession was inadvisable. After harvest, a rib roller should be used to break the clods, and weeds would germinate immediately after rain instead of growing with the crop. The roller also packed the soil more firmly. The 5-furrow or 7-furrow plough was the best. It required eight horses to draw it. Mr. J. P. Schultz found that the land which he cultivated most gave the best returns. Mr. M. Dreckow said that it paid best to plough in stubble. He had ploughed stubble into clay land which usually set very hard, but now it could be ploughed at any time. The Hon. W. Hannaford was experimenting with the idea of ascertaining whether shallow cultivation would more effectively clear the land of weeds than deeper working.

BLYTH, June 17th.—Mr. Spafford's article on "Takeall," from the June number of the *Journal of Agriculture*, was read by Mr. J. S. McEwin. Mr. Buzacott said that it would be difficult to burn stubble, as there was not sufficient growth on the patches where takeall had appeared. It would be better to cart straw there and burn it. Mr. A. L. McEwin said that he first used super. in 1898-9, putting six tons on 160 acres. He also sowed 160 acres without super. The result was that the manured crop averaged 19bush., and there was no takeall, whereas the crop which was not manured returned only 5bush. to the acre, and was infested with takeall. He had experienced no trouble from takeall since, except on a late fallow. Mr. W. Pratt had had considerable trouble with takeall, especially after a series of wet seasons. A proper seed bed was a check. Mr. W. O. Eime said that he noticed that takeall appeared after ploughing in deeply a heavy crop of cockspur. Deep ploughing and late fallowing encouraged it.

NANTAWARRA, June 15th.—Mr. S. Sleep tabled a sample of Rhodes grass raised in his garden. A small plot in a paddock was a failure owing to the disastrous season of 1914. The grass was a vigorous summer grower if provided with moisture, and would be a valuable fodder for stock in the absence of natural grasses. Members considered the grass unsuitable for the district, owing to the lack of summer moisture. Mr. T. Dixon, in the course of a general discussion, said that if ewes in lamb were turned into a paddock where stinkwort was in flower there was a danger of deaths resulting.

ROSENTHAL, July 11th.—Mr. G. Quinn, Government Horticultural Instructor, delivered an address on the principles underlying the pruning of fruit trees and vines.

SALISBURY, June 6th.—Mr. Goddard read a short paper on "Indigestion in Cattle and Sheep," touching on the various aspects of the complaint.

WATERVALE, June 12th.—DISCUSSION ON PLANTING CURRANT VINES.—Members favored early planting to secure the full benefit of winter rains. Mr. Burgess said it paid to plant well. He had obtained best results from putting a layer of earth over the roots and then sprinkling bonedust on top.

YORKE PENINSULA DISTRICT.

(TO BUTE.)

BUTE (Average annual rainfall, 15.42in.).

June 13th.—Present: 17 members.

BREEDING STOCK ON THE FARM.—"Stock can be bred more cheaply than it can be purchased," stated Mr. J. L. Davis, in the outset of a paper, which recommended farmers to breed their own stock. For breeding horses he advised mating the selected stallion at first with all the mares on the farm, and then selecting those which produced the best and most useful horses for future breeding. To build up a good class of horse only the best should be kept. A horse should have a good top, and not be too heavy in the legs. It should have plenty of hair. The best time for foals to arrive was during the months of July, August, and September,

so that they would obtain the advantage of green feed. Later foals missed the green feed, and did not thrive so well when weaned, besides, in many instances, becoming afflicted with blood worms. Those who kept only a few sheep for their own use should allow the ram to run with the flock all the year round. About 30 ewes would keep the average farm in meat. If the sheep were kept to produce income the rams should only be put in with the ewes, so that the lambs might be dropped in April and May, when the feed was green. Sheep should be frequently changed into fresh paddocks. Cows should be so managed that they would be coming in at intervals all through the year, for, if all came in at once they would probably all be dry about the same time. The bull should be frequently changed to avoid inbreeding. Properly managed the produce of one sow should keep the farm in bacon and provide pigs for sale.

MOONTA (Average annual rainfall, 15.22in.).

July 8th.—Present: 14 members and one visitor.

FODDER CROPS.—During the period from the falling of the first rains of the season until the end of July or beginning of August, observed Mr. A. B. Ferguson in a paper on "Fodder Corps," most farmers had a difficulty in providing sufficient feed for their stock, and it was then that the value of a good fodder crop was most appreciated. The most suitable crops in that district were oats and barley. Oats might not have the same feeding value when young as barley, but oats would not affect the wheat yield in the succeeding crop to the same extent as barley. If the oat crop grew to maturity there was fine feed value in the straw. Barley could not be surpassed for early growth and its quick fattening properties. It was easily cropped on stubble land, where, early in the season, it could be drilled in. Sorghum usually grew well, and came in as a good summer fodder, when other feeds were dying off.

DOWLINGVILLE, June 15th.—Discussion took place as to pickling wheat. Members generally favored turning wheat on the floor when pickling. The pickling should be done a sufficient length of time before sowing to enable the grain to become thoroughly dry before it was sown.

MOONTA, June 10th.—Mr. T. H. Hooper read a newspaper extract on "The A.B.C. of Rational Manuring." Mr. W. J. Brinkworth expressed the opinion that if guano super. and Thomas phosphate were drilled in the ground when fallowing, then the use of ordinary super. when seeding would be beneficial.

WESTERN DISTRICT.

COORABIE (Average annual rainfall, 11in. to 12in.).

May 13th.—Present: six members.

BUSH BUILDINGS ON THE FARM.—The high cost of sawn timber and galvanized iron necessitated a return to straw and bush buildings, declared Mr. E. J. Stretton in a paper on the erection of bush buildings on the farm. He recommended that the site for the stables should be selected to the east of the homestead, which obviated the dust nuisance in driving stock to and from the paddocks. For bush buildings, red mallee or long mallee forks, not less than 7in. in circumference at the base, should be used. They should be set 3ft. in the ground, and the outer line of forks should stand 7ft. above the ground. The centre line should be 8ft. out of the ground, and they should be 8ft. apart each way for chaff-sheds and 10ft. apart for stables, or 5ft. between each horse, and 10ft. between the centre and the outside. For the bearing rails, on the upright forks, be preferred red mallee, not less than 4in. in circumference, but the top row of rails from the centre to the outside forks should be 3in. in circumference. The fork should be outside the timbers, in order to prevent them slipping down. That would leave about 9in. of the butts overlapping the centre bearers. The top forks should be 12in. or 15in. apart. In many cases that was topped up again with brushwood, but he preferred to use netting stretched over the length of the roof, with about 3ft. of new stubble on top, which made a neat, light, almost waterproof roof. For the sides of the shed intermediate light uprights of mallee should be used and laced in with light "whipstick" ti-tree, as that class of brush did not sag in the same way as mallee, and

had the advantage of packing closer and keeping out rain, dust and poultry. Such sheds should open towards the east in order that the rain and rough weather might beat upon the back. Light hurdle doors with netting over them, would keep the poultry away *from* the wheat and chaff *in* the shed. The *centre forks for* the stable should be selected with a spur on them, about 5ft. 6in. from the ground for convenience in hanging up winkers and collars. In that way, those articles would be in front of the horse, instead of at the rear, an arrangement which always involved the risk of being kicked. The chaff shed should be erected as close to the stable as possible, to save labor in carrying feed—no small consideration when 12 or 14 horses required to be fed four or five times in the 24 hours. It was well to build the chaffshed and stables on parallel lines, with sufficient room at one end (preferably the north) for the haystack. The implement shed could be constructed on a similar plan, though the outer uprights should be so placed as to meet the necessities of the machinery to be housed in it. The seed drill would occupy the widest span, and two drills might be run into one span by taking the poles out of the drill which was put in first. It was wise to enclose the wet weather side of the shed. At the end of the stable a small shed should be built for heavy harness, such as saddles and spiders. The risk of fire in such sheds could be lessened by the exercise of reasonable care at all times. Mr. C. T. Giles expressed the view that unless it were imperative to build at present it was better to wait until the price of iron fell. He preferred stone buildings with iron roofing. Brush roofs required fresh material every year to keep them weatherproof. Mr. D. Riddle favored a brush and straw roof, which was warmer in winter and cooler in summer than iron. He recommended cutting long stubble with the binder and thatching the roof with the sheaves. The general opinion of members was that bush sheds must not be made too wide, because of the insufficient pitch of the roof, owing to the difficulty in obtaining upright forks of the required length for the centre.

ELBOW HILL (Average annual rainfall, 11in. to 12in.).

June 10th.—Present: 11 members.

FARM PRODUCE AND SUPPLIES.—Mr. R. S. Mills contributed a paper under the title "More Economical Methods of Buying and Selling the Wares of Producers." He suggested the formation of an association of primary producers with the object of eliminating the middleman and enabling the producer of one class of article to secure other articles direct from the producers thereof. A conference of representatives of the different Branches of the organisation would be in a position to study such questions as the economical handling of the products. He suggested that producers of wool should pay into a common fund 1d. for each lb. of wool selling at 6d. per lb. or over; that would in one season provide sufficient to build and equip a factory to turn out a finished article instead of the raw material. A good discussion followed, the majority of members agreeing that it was necessary for producers to organise for mutual protection.

KOPPIO (Average annual rainfall, 22.40in.).

June 13th.—Present: six members.

CARE OF LAMBING EWES.—Dealing with the care of lambing ewes, Mr. J. Newell expressed the opinion that a suitable paddock, near the homestead, with a fair amount of feed on it (green if possible) should be set apart for them. It was doubtful if such feed could be produced early in the season, therefore it was better to set aside a small paddock with a fair amount of natural grass, and with the first good rain there would be strong feed ready. If there were many lambing ewes it was best to keep them in an adjoining paddock until they lambed, and then, as soon as the lambs were able to walk, they should be removed to the paddock provided with fair feed and plenty of good water. It would pay to collect the lambs as they were dropped, and hand feed the ewes for the first week in a small enclosure. Ewes to lamb should always be separated from dry sheep before the lambing commenced. It would pay those having 100 ewes to lamb to divide them into two lots, the first 50 to lamb in April and May, and the second in August and September, which would give a better percentage, and one high-class ram would be sufficient, which would be a saving. To ensure the lambing season being as short as possible, the rams should be in good condition before being put in with the ewes, and each ram should be restricted to 50 ewes. It was stated in the course of discussion that early lambs always did best.

MILTALIE (Average annual rainfall, 14.55in.).

June 16th.—Present: 11 members and three visitors.

WATER ON THE FARM.—On a new farm the first consideration should be the provision of a good water supply, declared Mr. T. J. P. McEachen, in a paper. It was well to have the homestead centrally situated on the farm, but regard should always be had for the situation of the water supply, in order to obviate, as far as possible, the necessity for carting water. Every farmer should have a good tank of water as a stand by. A large amount of water ran to waste every year, which if conserved would save a lot of water carting. A tank should be put down well and strong, and if possible should be on higher ground than the horse yard, so that the latter might be supplied by gravitation. If the yard were higher than the water supply, a pump should be used so that there was a constant supply. The trough in the horse yard should be fitted with a ball tap, in order that it might not run dry nor run over. Mr. W. E. Hier supported the suggestion that water should be laid on to the horse yard, as the supply should be abundant and the horses should never be stinted. Mr. W. G. Smith deplored the extent of the time and money wasted in carting water. Mr. J. S. Jacobs did not favor balltrap troughs. Mr. H. R. Jacobs (chairman) preferred dams to constructing tanks where the ground was unsuitable.

PENONG (Average annual rainfall, 11.93in.).

May 13th.—Present: eight members.

SEEDING.—The Hon. Secretary (Mr. O. J. Murphy) contributed a paper as follows:—"The most important questions to be decided at seeding time are perhaps—(1) When to begin and when to finish sowing, (2) the procedure to be adopted, and (3) the kinds of crops to be grown and the order of sowing. No hard and fast rule can be laid down as to when sowing should be started, as the seasons vary considerably in regard to rainfall. Speaking generally, the period from the middle of April till the second or third week in June appeared to be the most suitable time to sow the crops. Reference to the rainfall records of our district, which are available for the last 24 years, show that a certain amount of risk is attached to sowing as early as March. The average rainfalls for January, February, and March are 36 points, 75 points, and 49 points respectively. It should be noted that the extraordinary fall of 6in. in February, 1913, accounts largely for the comparatively high figure for February—a figure which is not likely to be maintained. It is obvious that seed sown in March or earlier cannot be expected to germinate well, as a rule—the rainfall is not sufficiently high; and even if germination be good the rainfall of April, which has an average of but 85 points, combined with the fact that periods of hot weather are not uncommon throughout March and April, do not ensure a vigorous growth. Further reference to the rainfall records show that May, June, July, and August have average falls of over 1½in. Consequently the risks attending March sowing are not nearly so great in April, especially in the latter part of April. It may be stated with accuracy that seed sown in the latter part of April will, with very few exceptions, meet with conditions favorable to its growth. Early wheats, such as Gluyas, under normal conditions require about 16 weeks from the time of germination to ripen. Although the average rainfall during September is considerably lower than that of the four preceding months, it is fairly reliable. In only four out of 24 years has the rainfall for September been under ½in., so that September may be regarded as a favorable month. Consequently, early wheats sown in June, when they may reasonably be expected to germinate immediately, will have 13 or 14 weeks of good growing weather. The rainfall of October is on an average little less than that of September; but the records show that in eight out of 24 years less than ½in. has fallen in October. The comparatively high average for October has been probably influenced by thunderstorms, and, therefore, is not a reliable month. Also hot winds are likely to be experienced in October. It is well, therefore, to have the last wheats sown before the end of June. The procedure to be adopted will depend on the condition of the soil, and especially on the preparations. If new ground alone has to be dealt with, that is to say, land which is free of rubbish and being cropped for the first, second, or third time,

the crop results will depend very largely on the character of the season; but on older farms the problems are more complex. Grass land, more or less infested with weeds and rubbish, has to be dealt with, and unless some preparation in the way of fallowing has been taken, no large area of this ground can be cropped with success. I do not think sufficient importance is attached to fallowing. Apart from the better results obtainable, fallow has a special value in that it is ploughed at a time when there is not the same need to hurry as at seeding time. The plough can be set with the idea of removing stumps, and the stumps can be removed immediately. Land fallowed as early as July or August may need cultivating in September or October. A small flock of sheep will keep down any rubbish which may spring up during the summer months. Mustard, cockspur and thistle are readily eaten by sheep, and these are probably the chief enemies of our growing crops. I consider a good fallowing system far preferable to ploughing at seeding time when as few stumps as possible are pulled out by the plough, and these are too frequently left to obstruct the drill. Moreover, I believe that fallow will give better results than green ploughed ground, and especially so in the drier years. In 1914 I had an average of 4bush. of wheat from 220 acres fallow, whereas the land ploughed at seeding time failed in some cases to return seed, and in no case was half as good as the fallow. Green ploughed ground may produce good clean crops in a favorable season, but if the opening of the season is late, as in the present year, the farmer who is depending on green ploughed ground must either curtail the area sown or finish sowing late in the year. I consider the best procedure is to sow new ground first, then fallow, preferably after rain, and finally green ploughed ground. If rain has fallen before fallow is drilled it is advisable to use the harrows. I have found harrows very efficient in destroying mustard, cockspur, and grass if used while the plants are in the first stage of their growth. Practically the whole area placed under crop each year in our district is sown to wheat. Small areas of oats are grown mainly to provide horse feed, and still smaller areas of barley are grown. I believe that better results could be obtained if oats and barley were more extensively grown. The soil is well suited to barley growing. During the past three seasons I have obtained double the average of wheat crops from crops of malting and feed barley. Oaten and barley stubbles are more valuable as stock feed than wheat stubble; and it has been frequently pointed out that heavier wheat yields are obtainable by varying the crops than by adhering to the same cereal throughout. In regard to the order of sowing various wheats the practice of sowing large areas to early wheats at the beginning of seeding is inadvisable. In the event of a dry winter such wheats will run to head possibly as early as in July, whereas later varieties will stool and hold out against dry spells. Small areas of early wheats may be sown for hay with advantage; but the bulk of early wheats should be sown in May or June. Wheats such as Gluyas, which have a tendency to "go down" are less likely to lodge if sown in June rather than in April. Some difference of opinion exists as to the profitableness of applying artificial manures. It is to be regretted that apparently no experiments of scientific value have been undertaken to test the value of applying manures to our soil. The use of superphosphate is by no means regular. There is an opportunity here for this Branch to conduct experiments to prove conclusively whether the application of superphosphate pays. There is, however, no difference of opinion as to the effect of superphosphate on the growth of mustard and cockspur. The effect on mustard is very marked. This leads one to the supposition that if the mustard and cockspur were eliminated the superphosphate would have a good effect on the wheat crop. It would also seem to point to the fact that it may not pay to use superphosphate on soil which has not been freed of rubbish." Members agreed with most of points in paper. Mr. W. Place strongly advocated the use of superphosphate. He did not think barley growing would be profitable to any great extent on account of the uncertainty of the market. Mr. J. Stiggants also held that view; and considered feed barley to be too heating to be used as horse feed. Mr. J. C. Stiggants had found Cape oats a good variety to be grown in that district, both for hay and grain. He advocated the use of superphosphate, and considered an application of 30lbs. to 40lbs. gave best results. Mr. J. Oats had made a practice of beginning seeding in the last week in March, and had seldom experienced adverse results. He considered it wiser to sow in the last week in March rather than as late as the last week in June.

ROBERTS AND VERRAN.

July 7th.—Present: seven members and one visitor.

FARM MANAGEMENT.—When harvesting machinery had been finished with for the season it should be thoroughly cleaned, overhauled, worn parts repaired, and placed in a shed for protection from the weather, advised Mr. W. McCullum, in a paper on "Farm Management." A coat of paint would assist in the preservation of the implements and tend to prevent the nuts becoming loose. Only the best and most prolific varieties of wheat should be used. Fallowing should be commenced immediately after seeding. He preferred the mould board steel-plate plough, which was more effective in removing stumps than the disc implement. Fallow lands should be well harrowed, as the operation assisted in killing weeds and retaining moisture. The fallow could be kept clean with sheep, which would also provide a meat supply for the household. Pigs and poultry should be kept, because they could be fed upon the refuse, and thus become a source of profit. An indispensable adjunct of a farm was a blacksmith's outfit. That, combined with a little trade skill, would prove a great convenience in making repairs, besides effecting a considerable saving of time and money. Harness should be kept dry, and should be given at least two applications yearly of a mixture of equal parts of neatsfoot oil, resin, and tallow. Horses should be groomed every morning. During the period between seeding and harvest fences should be repaired, and stumps and stones removed from the fallowed land. Mr. F. Masters favored the disc plough if the land had much rubbish or shoots on it. Equal parts of resin and tallow made too stiff a dressing for harness. Mr. F. Imhoff said that the disc plough did not pull out the stumps, and when it became worn it did not cut any more shoots than the share plough. Mr. W. Sharman declared that the disc plough pulled out enough stumps for one man to deal with, and was best to treat shoots or rubbish with. Mr. A. T. Cowley considered that pigs and poultry should find a place on the farm. Machinery, when finished with, should be thoroughly overhauled. The class of plough to be used depended upon the nature of the land. If the surface of land ploughed with a disc plough were removed the bed would be found to be ridged, whereas the share plough produced almost a flat bed.

WARROW.

June 17th.—Present: 12 members.

GROWING KALE.—Sowing should take place in the winter months, not later than August, declared Mr. M. Kennett, in a paper on "Kale Growing," in order that the plant might develop and become well rooted before the summer months dried up the moisture. The plants needed moisture, and, after summer showers, made great headway. Kale could be sown with wheat, or any cereal crop, or could be grown in a bed, in the same way as cabbages, and then transplanted into rows about 3ft. apart. Kale belonged to the cabbage family, and was a gross feeder, therefore a plentiful dressing of manure was required. Seed sown in a paddock should be mixed with super., at the rate of 1lb. per acre. It should not be sown deeply in the soil. For the first year the leaves should be stripped, as grazing would probably result in the destruction of the plants. Kale, which was useful for all stock, generally lasted three or four years, and would carry a large number of stock in that period, a condition which should ensure a good cereal crop afterwards.

YEELANNA.

July 15th.—Present: 15 members.

FEEDING VALUE OF OATS.—In that district, remarked Mr. H. Solly, in a paper in which he discussed the feeding value of oats, the only practicable change crop was oats, because of the ravages of takeall, which did not affect oats to any great extent. The high relative value of the oat for general feeding was the outcome of its palatable qualities and the equilibrium of its nutrients, which gave it a fine balance as a food and the amount of hull and kernel provided a proper amount of concentration, and was not too much for safe feeding. For milch cows oats were at least as valuable, pound for pound, as bran. If fed dry, oats were not suitable to the digestive economy of the pig, but if soaked or boiled, they became more palatable and more useful, and pigs could be kept in fair condition on a diet of oats alone. No substitute had been found for oats as a food for horses, either in preserving health or maintaining mettle and staying power. The feeding

of oats to sheep from March to mid-winter, when the paddocks were usually bare, made it possible to maintain a larger and more certain flock, with the advantage of being able to fatten the surplus according to requirements, as the sole grain ration from ¾lb. to 1lb. of oats per day would keep sheep in health and good condition. Troughs or shallow boxes should be provided to keep the feed in. A suitable trough could be constructed of two pieces of oregon, 2ft. 9in. by ¾in., 12ft. in length. They should be nailed so as to form an L angle, and two pieces of oregon, 7in. by 1¾in., 2ft. in length, with V cuts in them, would hold the trough in position and provide feeding accommodation for 25 sheep. In the course of discussion, it was agreed that in that district sheep could be kept in good condition with little or no feed in the paddocks on an allowance of 1lb. of oats per day.

CARROW, June 15th.—ANNUAL MEETING.—Mr. F. J. Anear read extracts from Messrs. Metcalf & Co.'s report on the bulk handling of wheat.

COORABIE, June 10th.—Mr. Riddle reported having lost a milch cow and a heifer (shortly to calve). He described the symptoms and the result of the post-mortem. He also produced some dry caked matter, a sample of the contents of the tightly-packed bible of the cow. Discussion took place as to the possibilities of it being a case of dry bible or phosphorous poisoning, and it was resolved to send the matter produced to the Government Veterinary Lecturer for report.

KOONIBBA, June 15th.—A paper on "Wet and Dry Farming" was read by Mr. A. Moody. In the discussion which ensued, Mr. E. E. Lutz said that after ploughing his land twice and harrowing it five times to eradicate mustard, the weed came up as strongly as ever. Members agreed that wheat should always be sown before the rains, because the seed required all the moisture possible. Wheat sown early in June seldom did well. It was also recognised that scientific farming was essential, and that it was better to cultivate 300 acres according to proper methods than to crop 600 acres in a slipshod fashion.

MOUNT HOPE, June 30th.—Discussing the question of pig raising, Mr. T. Speed said he favored the Mid York breed, because they were quick growers. It was best to commence with a few sows in a wire netted paddock, which should be sown with barley, because grazing was the cheapest and best method of raising pigs. When the barley had ripened the pigs should be fed on grain to "top them up" for the market. Mr. J. Winstanley said that it would be necessary to put iron rings through the pigs' noses or the wire netting would not resist them.

SALT CREEK, June 17th.—A paper was read by Mr. B. Braunack on bulk handling of wheat. In reply to a question, Mr. Venning was informed that berseem seed should be sown in March or April.

EASTERN DISTRICT.

(EAST OF MOUNT LOFTY RANGES.)

COONALPYN (Average annual rainfall, 17.49in.).

July 14th.—Present: nine members and two visitors.

DISC AND SHARE PLOUGHS IN MALLEE LAND.—Discussing the merits of the disc and share ploughs, in a paper on that subject, Mr. J. F. Pitman stated that for clearing the land of stumps the share plough was the better, as it pulled out more stumps, and cut off equally as many shoots as the disc. If it were only required to cultivate the land and not pull out the stumps, the disc plough would answer all requirements, but even then he preferred a skim share plough, as there was heavy wear on the sockets of the disc plough, and it required a large amount of oil. The implement used should not be large if the land were stumpy and uneven. With an 8-disc plough the wheels were so far apart that they were frequently on the high patches when the discs were over the low patches, and *vice versa*, conditions which caused the plough to be drawing heavily one moment and running lightly the next, and producing a jarring effect on the horses. With a smaller implement, the wheels being closer together, seemed to control the depth of ploughing better. In wet weather he found that the 6-disc implement gave considerable side draught, especially if the surface were at all slippery. An 8-disc plough and a 4-furrow share

plough were quite large enough for stumpy country. Another disadvantage with large implements was that the frequent contact with the stumps soon strained the frame badly, and once that happened it was impossible to get the plough in good working order again. Mr. Hill pointed out the great difference between disc ploughs and disc cultivators. He preferred the disc plough, because it would work where a share plough could not be used. In land which had been neglected for six years he had cut 90 per cent. of the mallee shoots with a disc plough, but he would not say that it pulled out more stumps than the share plough. Mr. Cronin considered that share ploughing was cheaper because there was less wear. In stump land the excessive side draught of the disc plough caused imperfect work. In a plough weight did not always mean strength. Members generally were of opinion that a 4-furrow plough was a wide enough implement to begin with among stumps.

FORSTER (Average annual rainfall, 11in. to 12in.).

June 17th.—Present: five members.

VALUE OF FALLOW.—In a paper dealing with "Improved Methods in Farming" Mr. T. Searle combated the idea that intense culture was only suited to heavy soils in wet districts, and he urged that the more land in dry districts was worked the better were the results obtained. Heavy cultivation kept the land clean, and tended to conserve the moisture, with the result that the crops were better fitted to resist adverse weather conditions. In a district with the rainfall which Forster received it would pay to grow wheat only on fallowed land. A farmer with 1,000 acres would have a better chance of making good by sowing 300 acres and fallowing 300 acres every year, than if he put in 800 or 900 acres on stubble or grass land. With fallow land the seed could be sown more quickly, and it was less strain on the horses, as the ploughing would be done in the winter when the ground was in a better condition for ploughing, and there was not so much demand on the farmer's time. He preferred early fallowing with repeated harrowing and good cultivation in the spring to kill weeds and conserve moisture. The selection of seed was important, and the farmer should grow the variety best suited to his land and the district. For early sowing he preferred Purple Straw and Marshall's No. 3, but for late sowing he recommended Gluyas. For hay Yandilla King was a good stooler, with a good flag, and was a fairly high grower.

GERANIUM (Average annual rainfall, 16in. to 17in.).

June 17th.—Present: 10 members.

BLACKSMITHING ON THE FARM.—Mr. W. J. Mitchell contributed a paper with this title. He referred to the saving of time and money that could be effected by the farmer mending hames and hooks, making bolts, &c., and gave detailed hints for carrying out minor repairs. He had found the "blower" more satisfactory than the bellows for keeping up the forge fire. The procedure adopted in brazing, tempering, and sharpening shares was described, and the process of welding was explained.

HALIDON.

July 12th.—Present: 16 members and three visitors.

COLT BREAKING.—A colt's education should commence, observed Mr. J. W. L. Ritchie, in a paper on colt breaking, when he is about one month old. It was a mistake to delay the breaking-in operations until the colt was two or three years old, because, at that age, it commenced to have ideas of its own, was more cunning and considerably stronger, conditions which frequently involved the adoption of harsh measures, and the danger of damaging the colt. At first it was best to tie the dam in a stall, and then there would be no difficulty in catching the foal. Farm-bred colts were seldom frightened, and when they understood that they were not to be hurt, they would display a liking for being caught and handled. A leather halter should be put on, with a broad leather strap around the neck, and a "tie up" rope attached. The rope should be run through the ring under the colt's chin, and then he should be gently, but firmly, pulled first to one side and then to the other. The colt and his dam should

be then taken for a short walk. Those operations should be repeated for a few days, and on odd occasions afterwards. When six months old, the colt should be weaned, and he might then be tied up. A broad leather strap around the neck should be used for that purpose, but the rope should not be put through the halter ring. In the beginning the colt should be tied up short in a place where it was not possible for him to turn round. It was good training to lead him from his stall to water; but the colt should not be kept tied up longer than two hours at a time. If well grown at the age of two years it might be mouthed and bitted and put to light work; but if weedy, that operation should be postponed for another year. In mouthing a colt it was well to use a thick snaffle with large rings, and it should be attached to the halter with a small bit snap on each side. An hour or two should be allowed for the colt to become accustomed to the bit. In the absence of proper mouthing tackle, a strong surcingle, with a ring or buckle on each side, might be used. Side reins could then be put on, but only pulled up sufficiently to bring the colt's head to the near side. After running around for an hour or so the reins should be changed to the off side, and then gradually tightened, until the colt was compelled to walk in a circle. That operation might be repeated for a few hours for two or three days, when the reins might be put on each side, with both reins of equal length. He should be buckled up fairly short and kept moving for a while. When well mouthed, the colt should be led with a rein to the bit, and brought round first on the near and then on the off side. Next the colt should be taught to back, and the word "back" should be used at the same time as the horse was pushed rearward with a coupling on each side of the bit. In teaching it to back it was a mistake to jerk the colt's mouth or strike it. A simple method of teaching the colt to hold up its feet was to buckle a strong hame strap, with strong leather reins attached to the fetlock. The free end of the reins should be carried over the colt's back and under the girth. The foot should then be lifted and the slack taken up, by which means the foot could be kept off the ground, in spite of the animal's endeavors to put it down. That operation should be repeated with each foot, until the animal would permit its foot to be lifted by hand without the aid of a strap. At that stage the colt might be put to light work in a strong light spring dray. Before being put in the dray the colt should be led around it, with his harness on and permitted to have a good look at the dray. He could be either backed into the shafts or be tied up and the dray drawn up to him, the latter course being generally preferred. A good kicking rope should be put over the colt's rump and attached to the shafts. The colt should not be tired the first day, and before an attempt was made to take him out of the shafts he should be tied to a stout rail. If he proved too free in the team he should be tied back. Colts should never be lassoed, they should always be approached on the near side, and they should never be shouted at, but spoken to gently and firmly. Mr. C. H. Russell said that he preferred attaching the colt to a light log to placing it in the shafts of a dray. The Chairman suggested that, in teaching a colt to lead, a rope should be run along one side of the animal around the thighs and along the other side, and, when the horse refused to lead, the rope should be gently pulled in front. The rope should be supported by straps over the horse's back. Mr. H. L. Harris suggested using a rope with a ring in the end, instead of the usual slipnot, in catching fractious horses.

MONARTO SOUTH (Average annual rainfall, 14in. to 15in.).

July 15th.—Present: 23 members and four visitors.

FERN COUNTRY.—In a short paper on "Fern Country" Mr. B. Bormann recommended that first of all the ferns should be well burned. Then the land should be well fallowed, because the roots which were turned up would die. In summer the fallow should be well worked to destroy as many of the remaining roots as possible. Peas should be sown in season, and, if the peas were raked up, the ferns which did grow would not give much trouble. If wheat were grown, the ferns would be troublesome when stripping. After the peas had been taken up sheep should be put on the land to pick up all shelled peas. The land should then be ploughed again to prevent the ferns making a fresh start. This should be kept on for several years. Peas would grow on the same land year after year, but wheat seldom did well in successive crops.

MURRAY BRIDGE.

July 18th.

PRUNING DEMONSTRATION.—Mr. H. J. Darwent gave a demonstration in fruit tree pruning.

INSECT PESTS AND FUNGUS DISEASES.—The following paper was read by Mr. Darwent at the evening meeting:—"Fruitgrowers in South Australia on the whole have rather an intimate acquaintance with the subject of this paper, but many who are just starting out to plant orchards and vineyards have little or no knowledge of the havoc wrought by both insects and fungi, and to anyone taking up such an occupation it is essential that greater knowledge of the depredations caused by them should be obtained. The fruit industry both for fresh and dried fruits has ample room for expansion, and with the natural advantages existing, as they do on this fine river, it should be our aim to keep the new settlements as free as possible from pests of either kind. As an example of the need of watchfulness there is the enemy of the vinegrower, *Phylloxera vastatrix*, or grape-vine louse. This pest has caused enormous damage to the vine-growing industry in some of the other States, and it is only by strict attention by those in authority, and the co-operation of the people as a whole, that we may hope to keep our State free from it. We have laws and regulations preventing the importation of trees and plants except under certain conditions, but like any other law, if a person deliberately lays himself out to defeat the intention of the Legislature, he may do so, and so I would impress on you the importance of the carrying out of the law dealing with these importations in the interest of a large and growing industry. When we consider the question of destroying an insect it is necessary that we should know its life history, so that we may be able to attack it with the greatest prospect of success. In insects we generally find four distinct stages—firstly, the eggs; secondly, the larvæ; thirdly, the chrysalis or pupa; and fourthly, the perfect insect. Some, such as aphides, have no properly defined pupal stage as in the case of moths, where the pupa is quiescent and does not require food. In the case of aphides the insect is active in the pupal stage and feeds throughout it, and so they are injurious all their lives. In the other cases there is only a certain time when damage is done, that is, the larval or caterpillar stage. Insects may be divided into groups, according to their habits, as follows:—Chewing insects exposed from hatching until full grown; chewing insects exposed for only short periods of their life; chewing insects which eat the leaves, bark, and buds of plants; sucking insects which fasten themselves to the plants; sucking insects which fly from plant to plant; maggots which live under the skin of the fruit; mites which live on the leaves of trees; borers which destroy trees by boring into the trunk and limbs. Seeing that we have so many insects of different habits with which to contend, it is easy to see that there can be no great cure-all; but each class must be attacked at the proper time, and with suitable remedies and appliances. For chewing insects exposed from hatching until full grown we must use either a poison by placing it on the food which they eat, or a spray which kills by contact. An example of such an insect is the cherry and pear slug (*Selandria cerasi*). This slug is found on the leaves of the cherry, pear, plum, peach, and quince tree. It is black and slimy, and about half an inch long. It feeds on the upper side of the leaf, leaving nothing but a skeleton. When full grown it sheds its coat and appears buff-colored and dry, and goes into the ground, where it spins a cocoon covered with earth. Here it stops until the following summer. Chewing insects exposed only for short periods must be killed by using a poison by placing it on the food which the insect eats. The codlin moth (*Carpocapsa pomonella*) is an insect of this class. Arsenate of lead has been found to be the most successful remedy, the strength used being 1lb. of arsenate of lead to 20galls. of water. There are usually three broods of this insect in a season, so that it is necessary to apply several sprayings in order that the fruit may be coated ready for the advent of the larvæ. Bandages may also be placed on the stems of the trees to act as traps for the larvæ when they leave the fruit, but they must be examined every seventh day, and all caterpillars found under them destroyed. Another chewing insect is the curculio beetle (*Otiorrhynchus cribricollis*). A great deal of damage is done by this insect in some parts of the State. It feeds on the leaves, bark, and buds of the trees, devouring the whole. While it is obvious that arsenate of lead will also kill this insect, it is useless to have a mixture of a weaker strength than 1lb. of arsenate to 6galls. of water. There are also other means of trapping the beetles. Bands

of sheepskin with the woolly side out and combed may be tacked round the tree stem. The insects cannot fly, and in trying to get over the wool their legs become entangled, and they die. Another method is the placing of zinc or lead troughs, in which is placed oil, round and close to the stems of the trees on the ground, which must be finely worked so that no insect is able to get under the troughs. Success has also been achieved by the use of fine drift sand, placing it round the tree stems, and heaping it up in a cone-shape. The insect tries to climb to the tree and the sand gives way, burying the insect beneath it. Roses and other garden plants are often attacked by this pest. It secretes itself in the ground during the day, and attacks the plants at night. Sucking insects, such as scale and aphides, which fasten themselves to the plants must be dealt with either by sprays which kill by contact or by suffocation by fumigating the trees under gas-tight covers. In the case of deciduous trees the former method is by far the better on account of its being more easy to carry out when the trees are dormant, and because it does not entail the same expense as fumigation. Red oil emulsion or crude petroleum emulsion is recommended for winter use only. If it is found necessary to spray when the foliage is on the trees, then the best remedies are kerosene emulsion, resin wash, or lime-sulphur mixture. Evergreen trees affected by scale insects are more satisfactorily dealt with by fumigation, as it is almost impossible to thoroughly wet every leaf and twig of dense trees. In regard to sucking insects which fly from plant to plant, such as the Rutherglen bug (*Nysius vinitor*), there are no very effective remedies. The best known is benzole emulsion. The insects have an aversion to the smell, but as this soon goes off it would mean that continual spraying would be necessary. Fortunately, those insects of this class which do most damage to fruit only appear at long intervals as the seasons suit them, and hence the damage done by them is slight on the whole. Maggot pests, such as fruit flies, which live beneath the skin of the fruits, are perhaps the most difficult to deal with. The eggs are laid under the skin of the fruit by the female fly, which punctures it by means of a very sharp needle-like organ called the ovipositor, thus making it the most difficult to attack. It is uncertain how long the incubation of the eggs take, but there are several broods during a year. Nothing is more successful in fighting this pest than the picking of the infested fruits from the trees, and all fruit from the ground, boiling or burning it daily. As this insect has not yet taken up its abode in this State, there is no doubt but that prevention of its introduction should concern us first, for once it is established it would mean ruin to much of the fruit industry in a country like this where practically every home has a fruit garden. It is a matter concerning not only the commercial fruitgrower, but the whole community. The Bryobia mite (*Bryobia pratensis*), commonly called red spider, has caused a considerable amount of loss or damage during the last few years, due no doubt to the dry seasons experienced. When trees are attacked by this pest the leaves assume a sickly, speckled appearance, the green color giving place to a greyish-white, caused by the feeding of the insects on the leaves, which fall much sooner than they otherwise would. The leaves are thereby prevented from fulfilling their proper functions, and the tree suffers. In winter the eggs of the mite can be found on the underside of the limbs in any crevice or shelter that offers. They are of a bright red color, and are sometimes very numerous. Red oil emulsion or crude petroleum emulsion are excellent remedies to use against the eggs in winter, care being taken to coat every part of the tree thoroughly, especially the lower sides of the limbs. These remedies cannot be used when the foliage is on the trees. That which has been found to be most successful at this time is lime-sulphur mixture, but care must be taken to avoid spraying during hot weather or the result will be disastrous to the trees. One and a half gallons of this mixture to 100galls. of soft water has been very effectively used against this mite. Being also a splendid fungicide, it serves a two-fold purpose, and for this reason is rapidly growing in favor. Boring caterpillars are to be found in some parts of our fruitgrowing areas. They are found in the limbs and trunks of the trees, the holes being noticed by the accumulation of burrowings on the trees. The only effective remedy is to clean away the rubbish from the holes and insert small pieces of cottonwool which has been saturated with carbon bi-sulphide or benzine, and then plug up the hole instantly with moist clay. In regard to all the insect pests mentioned, if success is to be attained, it is imperative that they should be attacked at the right time with proper appliances, and the work done thoroughly with proved remedies. The thinning out of the

trees by pruning is a very necessary assistance, especially to spraying when the trees are in leaf, as it makes it much easier to wet every part of the trees thoroughly. In addition to insect pests there are fungoid diseases with which to contend. In a climate such as is experienced at Murray Bridge they are not likely to be so troublesome as in some parts of the State, notably the Mount Lofty Ranges. But while they may not show up to any great extent, they are often present, working insidiously, as it were, all the time sucking at the vitality of the tree. Prevention is better than cure, and that proverb is never better exemplified than in the dealing with fungoid diseases. A fungus is a plant, but it produces no flowers nor the green coloring matter seen in the leaves of other plants. It forms seeds, known as spores, and roots, known as mycelium. These roots make their way down into the wood, and live on the tissues at the expense of the plant, thereby seriously affecting, if not destroying it. This renders it practically impossible to apply any remedy when once the plant is attacked, unless we can remove the part attacked. The mycelium send out branches, each of which bear a receptacle containing many spores, known as conidiaspores, the masses of these producing what is familiar as mildew or mould. These conidiaspores are distributed over the plant in moisture, and the same process is gone through again. It is essential that the fungicides used to prevent the spread of the fungi be applied at the times which experience has shown us are right. Different fungoid diseases require treatment at different times. The gumming disease of the almond and peach (*Clasterosporium*) is one that will be familiar with growers of these fruits. If the trees are examined closely in autumn many of the buds on the previous season's growth will be found to be covered with a thin film of gum. If the buds be examined closely it will be seen that they are dead. Each year this goes on unless the trees are sprayed, and they become quite bare except for the last season's growth. It has been found by Professor Smith, of California, that the spraying of trees affected by this disease must be done as soon as the leaves fall in autumn. Another spraying when the color of the blossom is showing in spring would be beneficial, and it would also act as a preventive of peach leaf curl (*Exoascus deformans*). The spray to be used in each case would be Bordeaux mixture. The shothole and scab of the apricot (*Clasterosporium*) is a disease which causes disfiguration of the fruit as well as damage to the leaves and tree as a whole. The appearance of small dark round patches on the leaves, which eventually fall out, is the first notice of its presence. Later the fruit assumes a scabby appearance, which reduces the value of it, and destroys it for drying purposes. Bordeaux mixture applied in spring when the color of the blossom is showing is the most effective remedy. Black spot of the apple and pear (*Fusicladiums*) are among the most prevalent fungoid diseases we find in this State, and are well known. They attack the leaves, twigs, and fruit, doing enormous damage in some of the wetter parts, such as the Mount Lofty Ranges. Bordeaux mixture applied when the color of the blossoms is just showing and repeated after the fruits form has been very effective. Lime-sulphur mixture has also been used successfully, and is favored by growers because it is also an insecticide. There is also less danger of the fruit becoming russety when spraying is done with the foliage on the trees. Oidium or mildew of the grapevine (*Oidium tuckerii*) often attacks the vines, and can be checked by dusting flowers of sulphur over the vines just after the first leaves appear, and again when the vines are in bloom. A quick method of doing this in a vineyard is performed by a man on horseback, the sulphur being carried in a sugar bag, and as the horse walks along the row the bag is shaken over the vines. It is necessary that a still morning preceding a bright sunny day should be selected for this operation so that the warmth will make the sulphur effective. Black spot or anthracnose (*Spaceloma*) is another fungoid disease which affects the vine. The vines should be pruned and the prunings burnt. Then any old bark should be removed, and the limbs, spurs, and rods swabbed with a solution made as follows:—Pour half a pint of sulphuric acid over 50lbs. of sulphate of iron, and then dissolve the iron crystals in 10galls. of boiling water. It is necessary that a wooden vessel should be used, and that the clothing and hands be protected. One often hears the expression 'near enough' used by gardeners in regard to the preparation of spray washes. The various formulæ distributed by the Department of Agriculture are the result of years of experiment, and I would urge upon growers the necessity for observing exactness in preparing them, so that the best results may be obtained."

PARRAKIE (Average annual rainfall, 16in. to 17in.).

June 10th.—Present: 11 members and three visitors.

FALLOWING.—In an interesting paper on the subject of fallowing Mr. F. C. Heinzel recommended starting as soon as possible after seeding, July and August being the two best months. Generally speaking, sandy soil should be worked to a depth of not more than 3in., and clay flats about 4in. From year to year clay flats might be worked somewhat deeper, but care should be taken not to turn up too much clay at one time. The ploughing should cut an 8in. furrow, and the soil should be well turned to bury the weeds and rubbish. A share plough was superior to a disk for turning the soil and clearing out stumps. After ploughing the land should be harrowed crosswise before it set hard. The harrows, in addition to levelling the ground disturbed the stumps and facilitated picking. Weeds should be destroyed by cultivation in the early spring. The clay flats should be harrowed again, but not the sand, as the latter, if left rough, was less likely to drift. In the ensuing discussion, members agreed that sandy soil should be worked lightly and then left. The too frequent use of harrows in sand encouraged drift. The Chairman recommended ploughing to a fair depth in heavier soils, and thought sandy soils should be worked as little as possible. One harrowing was sufficient for fallow. He would use the cultivator more, and see that the harrows followed the drill. In a discussion on the most suitable wheats for the district, Red Russian, Yandilla King, and Gluyas were mentioned.

BARLEY.—Mr. J. G. Temby thought every farmer should put in 50 acres of barley, preferably malting. In the drought year his wheat return was nil, but the barley yielded 3bush. It provided good early green feed, and was a fast grower. The splendid stubble barley straw provided for burning, was a great help in new mallee districts.

WYNARKA.

June 17th.—Present: 11 members.

IMPROVEMENTS IN FARM STOCK.—There was necessity for the improvement of all classes of farm stock, remarked Mr. W. Richardson in a paper on that subject; but he emphasised the importance of giving more attention to the character of horses produced and maintained on the farm. On the majority of farms horses were bred merely for the performance of the necessary work. With a better grade of foundation stock, however, and more attention to the selection of stallions, but without going further in the direction of breeding than the usual supply of farm horses justified, stock could be produced which would handsomely increase the farm revenue. There was a great demand for good horses, and it was so diversified in character and so wide in extent that production practically could not be overdone. There was a ready sale for every good horse, and, therefore, there need be no restriction as to type, and each person could exercise his own preference. Whatever the type selected, the aim should be to breed for strength and stamina, with a fair measure of style and a movement and disposition suited to the purpose to which the stock was to be devoted. Nondescript stallions, without style or character, should be avoided. The best mare the farmer could afford to possess should be mated with the best stallion available, keeping in view always the general qualities, size, strong bone, heavy muscle, good appearance, soundness of parts, and evenness of gait of the animal selected. Cheap low-bred country stallions should be rigorously avoided, also horses of unfashionable colors and those which entailed upon their progeny white faces and three or four white feet, a class of stock which was not popular. A colt from a highly-bred mare could be raised just as cheaply as that bred from an inferior animal. Liberal feeding of colts always repaid the owner, and the young stock should be handled early and frequently.

BOOKPURNONG EAST, May 27th.—Mr. K. O. Schulze read a paper on "Fences on the Farm," in which the subject was dealt with in detail, and he concluded by describing a model fence. He favored boundary fences being netted on rabbit-infested areas. Posts for such fences should be 20in. in the ground and 3ft. 8in. above ground. Division fences should carry six wires, a barbed wire being on top, and the spaces between the other wires 11in., 8in., 7in., 6in., and 6in. That arrangement would result in the bottom wire being 3in. from the ground.

BOOKPURNONG EAST, July 13th.—Mr. Henshaw Jackson, the Wool Instructor at the School of Mines, delivered an address on sheep and wool, and the types best suited for the district.

MYPOLONGA, July 12th.—A practical demonstration of milk testing was given by Messrs. Cailes and Kloemann, and, in answer to questions, Mr. Cailes advised that cream should be stirred three times daily in order to permit gases to escape. It was also necessary to ensure that the cream was at a sufficiently low temperature in summer before churning.

POMPOOTA, July 6th.—In the course of a general discussion it was agreed that the cultivation of passion fruit would be profitable if the vines were planted between trees in the orchard because they would yield fair returns during the period anterior to the fruit trees coming into bearing. Members also agreed that strawberry plots in the area below Murray Bridge produced high-class fruit for several months, and, if markets could be found, the culture of the berry offered attractive prospects to small holders. It was also stated that quince hedges on reclaimed plots were proving valuable as breakwinds and heavy fruit producers.

SHERLOCK, July 12th.—In the course of discussion after the business of the annual meeting, Mr. D. Nock stated that he was applying quick lime to his land through the drill at the same time as he sowed the wheat. The general opinion of members was that lime should be applied when the land was fallowed, or at all events some weeks before the crop was drilled in.

STIRLING'S WELL, June 17th.—Mr. W. McGlasson delivered a lecture on farm buildings. He observed that in pegging outbuildings, instead of using a small square about 1ft. in length, an easier and more accurate method was to make a triangle with sides 3ft. x 4ft. x 5ft. at one or two corners. If the triangle were measured out properly, the building would be absolutely square. In constructing a tank stand, the base should be larger than the top, and the wall sloping inwards, which produced a far stronger and neater work.

WOODLEIGH, July 15th.—Mr. Henshaw Jackson delivered an interesting address on wool.

WOLLOWA, June 16th.—A paper was read by Mr. E. K. Mallyon on "Chemical Action," in which the processes in the change of the form of matter by decay, fermentation, and fire were described.

SOUTH AND HILLS DISTRICT.

KANMANTOO (Average annual rainfall, 17.90in.).

June 17th.—Present: 10 members.

PRUNING FRUIT TREES.—Dealing with the subject of "Pruning Fruit Trees," Mr. C. J. Downing remarked, in a paper on that subject, that June and July were the usual months for pruning in that district, but the time depended largely on the kind of tree to be treated. The time to prune could be determined by the shedding of the leaves, when the spurs, buds, and decayed wood could be more easily discerned. Apricots, peaches, and most kinds of stone fruit were the first to be pruned, just as they were the first to shed their leaves. Pruning shears or secateurs and saws should be kept sharp and well set in order that the young tender shoots might not be bruised in cutting. The shears should be held with the blade towards the trunk of the tree and the hook against the part to be cut, and they should be operated with a firm even pressure, and not jerked. Care should be taken to form a young tree in such a way that neither the wind nor the sun would be likely to destroy limb or fruit. The cup or wineglass shape was considered best, some of the benefits being facility in pruning and the gathering of fruit. It was also an advantage in cultivating, because it was possible to plough much closer to the trees. All limbs crossing one another or growing towards the centre should be removed, as well as any decayed shoots. When a tree had been pruned correctly for a few years it only required to be cut back slightly every year. In trees pruned too severely there would probably be too much wood growth, and the fruit production would be retarded for several years. It was well to keep the shoots on the same level all round the tree, otherwise the highest ones, receiving more sap, would grow more rapidly and deprive the lower shoots of sap, leaving them stunted. That effect could be avoided, to a certain extent, by nipping the top buds out of the highest shoots.

and if that were not sufficient, summer pruning might be resorted to. That applied mostly to young trees. Vertical shoots always grew the strongest, because the sap flowed more freely through them than through horizontal shoots, an indication that the vertical shoots ran to wood and the horizontal ones to fruit. Care should be taken, therefore, not to thin out too many horizontal shoots, or there would be a shortage in fruit the following season.

MIXED FARMING.—Mr. L. J. Wooley, in a paper pointing out the advantages of mixed farming, said:—"Climate and soil are so favorable to the production of all kinds of grain, fruits, vegetables, and livestock that there is practically no limit to the scope of the mixed farmer in South Australia. A few years ago the land was cropped year after year without a rest, and without manure, with the result that it became impoverished and foul with weeds, and gave low yields. But all this is rapidly giving place to a better system of farm husbandry. The special and peculiar problems of soil and climate, which are always largely governed by local conditions are now better understood. It has been found that fallowing wheat lands in winter and keeping them well worked during the succeeding spring and summer provides an excellent seed bed for the following autumn, and conserves soil moisture so that, even with a light rainfall during the growing period, an excellent crop is secured on fallowed, as compared with unfallowed land. Also the former is much freer from wild oats and other weeds, which tend to reduce the yield of plump grain. On farms of from 600 acres I recommend the third-year system of wheat-growing, *i.e.*, fallow, wheat and grass. Many of the smaller holdings could practice this system with advantage also. I find that good results are obtained from fallowing to a depth of 6in. to 8in., commencing immediately after seeding, and in the final ploughing prior to seeding, to about half the original depth. I suggest that every farmer should utilise his fallow for growing fodder crops of some kind. On stubble land, sown about the end of March, a mixture of rape, kale and oats would provide feed for stock during the early winter months. Lucerne is invaluable as a summer fodder, especially for dairy cattle. Sheep are indispensable to every farm, not merely as weed exterminators, but as wealth producers. The farmer who has an eye for wool growing, will find the Merino the most profitable class of sheep. Besides the high quality of its flesh makes it keenly competed for by the butchering trade. Breeders of this type should keep in mind the great importance of breeding from the best ewes available, while the selection of a suitable sire is of no less importance. Lamb-raising for market purposes is also profitable in certain districts. Where the farmer is within a reasonable distance of a market, however, the topping up of stores may be found quite as satisfactory as the raising of lambs for market. Special attention should be given to the dairy herd. On the smaller holdings dairying is probably of more importance than sheep, as with a few good cows a very substantial income can be obtained. Three or four first-class milkers well attended to are of less trouble and pay better than double their number of the ordinary run of cows. The best all-round cow for the farm is probably the Shorthorn, which, in addition to being a good milker, is valued for beef purposes. Other good strains are the Ayrshire, Holstein, and Jersey. Holsteins are great milk producers, though the percentage of butter-fat is hardly equal to that of the Jersey or Ayrshire. However, the Holstein has proved excellent to cross with both the Ayrshire and the Jersey. Cows, to do well, require to be kept warm, and beneficial results would be obtained from rugging. Pig-raising is also very profitable with dairying. Poultry is one of the chief by-products of the farm, and farmers should endeavor to make a continuous improvement in the class of fowls kept. A small portion of the land should be planted with fruit trees and vegetables of some choice varieties sufficient for family requirements.

MOUNT BARKER (Average annual raintall, 30.93in.).

May 17th.—Present: 46 members.

CARE OF FARM MACHINERY.—Commenting on the care of farm machinery, Mr. F. Simper, in the course of a well-considered paper on that subject, said that the plough should be carefully set by the maker, and perfectly adjusted by the user, in order that it might do its work soundly and satisfactorily. If the implement became strained or bent, it should be adjusted immediately or inferior work would result. When axles became worn, the wheels wobbled, a defect which might be remedied with a little packing of binder twine flattened out, or horsehair. When

in use axles should be greased daily, and at the end of the season mould boards and discs should be oiled or greased and put away. Harrows should be placed so that the tines would not rust in the ground. The woodwork of all implements should be painted occasionally, and the iron parts also, but not so often. The life of a machine could be appreciably prolonged by keeping all the bolts tight and the bearings clean. It was necessary to keep the seed drill free running in all its parts. By neglecting to cover the machine in wet weather the manure became clogged, and cogs and spindles were broken and uneven distribution resulted. It was necessary to keep the small axles in disc drills well oiled. Some of the wear on the discs could be avoided, and the draft lessened, by attaching cocktail harrows to the rear, a method which had the advantage of helping to cover the grain, and permitting the discs to do their work at a shallower depth. All the mud should be cleared off the machine, and the discs oiled before being put away. Before harvesting was commenced all the requisite machinery should be thoroughly overhauled, bolts tightened, broken or worn parts replaced or repaired, bearings packed up in order to make the cogs run in line, and everything put in good working order. Leather belts required to be well dressed with castor oil to increase their gripping power, and, if treated in that way required no sticky compounds to keep them on. The knotter of the binder, the most troublesome part of the machine, required to be kept clean, because if rusty when cutting commenced a breakage might be caused or the machine severely strained. It was essential that the blades should be kept sharp, and all necessary parts thoroughly oiled three times a day. It was well to use a little kerosine with the oil the first time for the season, to free the bearings. Ledger plates demanded careful attention. When in good order they should allow the knives to run level, and, if the top edges became rounded, they could be greatly improved by filing them straight and square—the filing to be done upwards, and from the bottom of the fingers. To ensure the beaters of reel running parallel with the fingers when in the crops, they should be set, at rest, with the end near the grain divider a little higher than the inside end, because there was always a tendency in the outside end to drop. In a light crop large sheaves could be tied with advantage, as it saved twine, but in a heavy crop the compressor arms should be adjusted to give a sheaf on the small side, and thus avoid the straining of the knotter through being choked. All canvas should be removed, and all tension springs loosened before the binder was put away. Heavy oil was required for the stripper, because thin oil ran away quickly in hot weather, resulting in hot boxes and spindles and heavier draft. When starting a stripper into a crop, the belt should be gripped and pulled backwards, in order that the parts might develop rapid action as the horses commenced to move. Adoption of that method minimised choking, prevented breakages, and saved waste of grain. When not in the crop, the machine should be thrown out of gear. If at all damp when commencing work of a morning, it was wise to take only part of a cut, as it would relieve the horses and render the stripper less liable to become strained. The first essential in the care of a winnower was to preserve the seives and screens from rust. Chaff-cutters and threshing machines needed proper setting in order that all pulleys should run in line. If it were not intended to move the machines often they might be set in concrete to prevent them getting adrift. All engines required to be kept thoroughly clean, or the full power would not be derived from them. Whilst still warm after use the outside of the engine should be rubbed with cotton waste to clean it. The covers might be taken off in spare time, the oil drained off, and the cylinder and piston cleaned. All bolts should be kept tight, and the engine should only be fed with good, clean oil. In conclusion he emphasised the absolute necessity for providing for the protection of implements and machinery from the weather an iron shed, from which fowls should be rigidly excluded. Finally there should be a place for everything, and everything should be in its place.

MAKES OF FARM MACHINERY.—Mr. B. Pope read a paper on this subject.

MILANG.

June 16th.—Present: 37 members.

POULTRY KEEPING ON THE FARM.—Extensive statistics were quoted by Mr. D. J. Turvey in a paper on "Poultry Keeping on the Farm," to show the extent of the egg industry in America and the income available to egg-raisers in Australia, using for the latter proposition the figures of the last Burnley egg competition.

He strongly recommended White Leghorns as the most profitable breed, though Black Orpingtons, Silver and White Wyandottes were good payable breeds, which were useful for the table, and had become exceptionally fine eggiayers, where proper attention had been paid to their development in that respect. Housing was necessary for the fowls, in order to stimulate laying in the winter months, when eggs were dear, and that they might be fed properly. A scratching shed should be provided for laying hens, and they should be fed in it. They should be kept warm and busy; the busiest hen was the best hen. Fowlhouses should face the north, to catch the morning sun, and be sheltered from rough, cold weather. They should be roomy, but wood should not be used in their construction, because it afforded harbor for vermin. Perches should be on the same level, to avoid fighting for positions on the top. They should not be higher than 18in. or 2ft. from the ground. Wire-netted runs should be provided in front of the house, and wire-netted lucerne plots at the rear, with a plentiful supply of clean, fresh water. There should be no overcrowding, which always brought about disaster. It was far more profitable to sell the surplus stock at market rates. Every bird should yield a profit, and the unprofitable ones should be weeded out. For egg production pullets were more profitable than older hens, and it was a mistake to keep hens beyond their second year. The old stock should be disposed of in the late summer or early autumn. In mating, strong, healthy birds which were good layers should be selected, and the male bird should be descended from a good laying strain. Breeding pens should consist of from six to 10 hens to each male, and they should be mated 10 or 12 days before the eggs were used for incubation. For feeding, a ration of two of bran to one of pollard might be supplied in the morning, green feed in the middle of the day, and grain about 4 p.m. There should always be a liberal supply of grit and charcoal, and a small amount of animal food, which greatly stimulated egg production, should also be given.

NARRUNG (Average annual rainfall, 17in. to 18in.).

June 17th.—Present: eight members.

PLOUGHING AND SOWING.—A paper on "Ploughing and Sowing" was read by Mr. L. Thacker, who recommended ploughing to a depth of 4in. or 5in. Crops were always best where the ploughing was deepest. It had been observed that where rabbit burrows had been ploughed in the crop was most prolific. He preferred the set plough. In sowing oats it was advisable to drill 1½bush. or 1¾bush. to the acre on the light soil of that district, and 2bush. on black soil. Drilling should be deep, and for hay crops the ground should be cross-drilled, and the crop should be sown as early as possible.

PORT ELLIOT (Average annual rainfall, 20.33in.).

June 17th.—Present: seven members.

SHEEP FOR FARMERS.—"Farmers should rear their own sheep," declared Mr. Jas. Chibnall in a paper on the sheep for farmers. The flock, he said, should be commenced with large-framed, well-shaped Merino ewes, which should be crossed with Lincoln or Leicester rams, the English Leicester for choice. He favored medium-sized sheep, as they were easier to keep, and the joints were more suitable for general requirements. A beginning could be made with 50 Merino ewes and one ram (Leicester), which could be bred from as long as they would produce. The reason for suggesting 50 ewes and one ram was that that was more likely to produce an even lot of first cross ewe lambs for a foundation. The pick of those first cross ewes should then be crossed with a Merino ram, plain-bodied, and as long in the staple as possible. After that cross, the breeder should use his own judgment, and then a dense-fleeced Merino ram would probably be most suitable. The Leicester ram should then be reverted to again. When sufficient ewes of one type had been secured, that standard should be maintained, and the ewes could be sold or fattened. Wether lambs could be marketed. If the price of wool did not decline, it would be better to keep them until 4-tooth or 6-tooth, so that there would be an annual draft of first-class sheep, which, at present rates, would realise a substantial price. Mr. H. Welch favored Lincolns for farmers, especially in the southern parts of the State, for their wool was valuable and their carcass large. Mr. Cudmore was well satisfied with the results from crossing Merino ewes with a Leicester ram. Members referred to the difficulty of securing early lambs from English breeds, especially Shropshires.

BLACKWOOD, June 19th.—In a paper strongly advocating the use of softwood fruit cases, Mr. C. D. Goteh said that they were lighter to handle ,and did not shrink and buckle in the same way as hardwood cases, especially if the latter were made of green wood. Mr. D. R. Williams read a paper dealing with the life history of the cockchafer. The grub, he explained, subsisted on the small roots of herbage, trees, or shrubs. The mature insect wrought destruction by feeding on the leaves of practically any plant. After dealing with the life cycle of the insect, the writer of the paper referred to the many enemies which kept it in check.

CHERRY GARDENS, June 13th.—Mr. S. W. Chapman read a paper, in which he described the cultivator, which he had found most effective in his orchard, which was fairly level with loose soil. Members advocated working orchard land down to a fine tilth with the cultivator, thus assisting the retention of moisture.

CHERRY GARDENS, July 11th.—Mr. A. J. Mildwater read a paper entitled "Growing Onion Plants," and recommended the selection of the best-shaped onion, and not the largest size, for seed. Onions for seed should be kept in a dry place until spring, and then planted in good soil. When ripe, the seed should be gathered, cleaned, and hung in small bags, until the time for planting arrived. Sowing should take place in April, in order that the plants might be up before the rain set in. In preparing soil for planting it should be well dressed with manure, and well watered to bring up all the weeds. The seed should be planted in rows about 12in. apart, and should be sown thinly to produce strong, healthy plants. By planting in rows artificial manures might be applied whilst the plants were growing, and the soil between the rows hoed to keep it in good condition. For early market, he preferred the White Spanish, but for keeping and later use Brown Globe was a sound variety. Mr. H. Paddick preferred raised beds, 2ft. or 3ft. wide, and sowing broadcast.

IRONBANK, June 17th.—Mr. W. Coats read extracts from a publication dealing with the tillage of orchards, and members agreed that, in that district, tillage of the orchards was necessary. In answer to a question, Mr. Coats said that the best method to grow mangolds was to make holes with a wooden dibber the desired distance apart, fill the holes with rotted yard manure, and plant the mangolds in the manure.

MYPONGA, June 14th.—Mr. J. J. Muller read a paper on "Making Farm Life Attractive," advocating thrift, sound business principles, and industry, which meant prosperity, the most attractive quality of a farm.

STRATHALBYN, July 11th.—Mr. Springbett read a paper on vine pruning.

SOUTH-EAST DISTRICT

KYBYBOLITE (Average annual rainfall, 22in.).

June 22nd.—Present: seven members.

BREED AND CARE OF COWS.—As the result of 25 years' experience Mr. C. H. Scholz declared, in the course of a paper on the "Breed and Care of Cows," that, after trying a number of breeds, he found the Jersey the best for butter purposes, though other breeds gave more milk. He recommended feeding cows with a kerosine tin full of chaff and a quart of bran night and morning, and he instanced improvements he had obtained in milk yields by that means. Cows also required a good grass paddock, but should not be run with sheep and horses, as they required longer feed. A lucerne patch should be provided for summer feed. With chaff at £2 10s. or £3 per ton it paid better to feed it to cows than market it. Cows should be housed at night, and afforded accommodation to enable them to lie down. The house should be roofed with straw, which was cheaper than galvanized iron and not so cold in winter. The floor should be blocked, and the shed should be wide enough to provide a passage along the front for feeding purposes. The manger should be higher in front than at the back, so that the cows should not waste the feed. A yard big enough to hold all the cows on the farm should adjoin the shed. It should not be too small, and should be metalled so that it might not

become boggy in winter. Mr. L. S. Davis advocated wetting chaff before feeding, as it assisted the action of the digestive organs. Mr. H. R. Scholz preferred rugging cows to housing them. Mr. H. Bradley favored the Shorthorn milking strain, as he considered the Jersey too delicate. Mr. S. Shepherd also favored the Shorthorn milking strain if required for beef as well as milk, but as that was not a beef-producing district, he preferred the pure Jersey strain, and was against mixed breeds. In a general discussion members agreed that a heifer should be sent to the bull when 18 months or two years old. Mr. Shepherd deprecated the practice of keeping the first calf, as it tended to deteriorate the quality of the breed.

MOUNT GAMBIER (Average annual rainfall, 32in.).

Present: 25 members.

EXHIBITS.—A sample of ensilage, composed of lucerne, subterranean clover, with a little silver grass, was tabled by Mr. H. Buck, who also exhibited several specimens of 90-day and Horsetooth maize.

PICKLING WHEAT.—A short address on this subject was delivered by Mr. Collins, and a lengthy discussion followed.

PLANTING OF FRUIT TREES.—In a paper on this subject Mr. R. Fowler said:—"Preparation of the soil requires careful attention at the outset, as once the trees are planted it is not practicable to do more than the ordinary cultivation. If virgin land, it should be thoroughly cleared of all trees, stumps, roots, and stones, and the whole surface should be ploughed to a depth of 6in. or 8in. If the subsoil is hard, it should also be broken up with a subsoiler, but not brought to the surface. This is done by letting the subsoiler follow the mouldboard plough. As most of the land in this district has an open or gravelly subsoil, it is not so necessary to subsoil. This work is generally performed in the autumn or spring, when the ground is sufficiently wet to permit a plough to work, but in this district it may be done almost any time. Neither is it necessary to discuss the question of drainage, though this is an important factor in localities that have a stiff clay subsoil and a heavy rainfall, and in irrigated orchards. Having cleared and ploughed the land, proceed to mark out where the trees are to be planted—good short stakes should be provided for this purpose. The distance apart the trees should be will depend upon circumstances to some extent. It is usual, in ordinary soils, for commercial purposes, to plant 20ft. apart each way on the square. This will give 108 trees to the acre, and is certainly the most convenient method of cross-working and all the various other orchard operations. In a small home garden the distances may be reduced, to suit conditions, down to 16ft. apart; but that is about the limit. It may seem at first quite far enough, but allowance must be made for the growth and future working. If you desire to plant 20ft. apart make a line, having the 20ft. spaces marked off, then peg down each side carefully, allowing at least 20ft. to 30ft. for headlands, and if a breakwind has been planted—and this is a very necessary protection and one that should always be provided—the first row should not be nearer than 50ft. or 60ft. Then, starting from a right-angle corner, draw the line across from peg to peg, and carefully mark off the places. Having pegged out the ground, holes should now be dug about 4ft. square, with the centre of the hole where the tree will be placed. It is not recommended to dig deep holes. A good plan is to dig down about the depth of the spade, removing the soil, then loosen up the subsoil the depth of the spade again, but do not remove it, and if a supply of well rotted stable manure is available mix four or five good shovelfuls with the subsoil, and also a little bonedust or basic slag can be added. The holes can then be almost filled in again and the tree planted. Considerable care should be taken over planting. First of all, all broken roots should be carefully cut back to healthy tissue, and all shrivelled fibrous roots may be cut off as well, and the tree should not be planted any deeper than it stood in the nursery. This will generally be indicated by the soil marks and discolored bark. The roots should be spread well round, and with a downward tendency, the tree being planted on a small mound of earth close to the stake. It very often happens with nursery stock grown close together that the roots have a tendency to grow stronger across the rows than along them and where a tree is provided only with one or two strong roots it is well to place one in the direction the prevailing wind comes from to brace it up, otherwise

there is a danger of the tree being blown over. The soil should be firmly trodden down between and upon the roots at planting time, and it is better to leave the pruning for a few weeks. The young tree should be secured to the stake. The ground should be securely fenced, made rabbit proof, and should not be used as a run for the calves at any time. For the farm garden a wider range of varieties is available, but the main thing to keep in mind is to have a good succession of fruit, and at the same time the best for eating and preserving purposes, the main object of the garden being to supply a healthy and necessary addition to the daily menu. For commercial purposes consideration must be given to the markets available, the grower of fruit for the local market planting kinds, if possible, that have been proved a success in his own district, and varieties that will come in when best prices are obtainable; while for the grower on a large scale his efforts are generally limited to export keeping varieties and those fruits that can be profitably dried. Fruit being perishable, thought must be bestowed beforehand on the probable outlet for the produce when it is grown. The best time to plant deciduous trees and vines is during early winter—that is in May or June—while the soil still retains some warmth and has received a good soaking rain. They will send out fresh fibrous roots and establish themselves; even though the leaves fall the tops are at rest. Trees planted now will have a considerable start over those planted in August or September, although trees may be planted with success even as late as that. Citrus trees do best when planted out in early spring. The young growth is not then so liable to be cut back by frost as is the case when planted in the autumn. Pruning should be done after the planting, and is an operation very often neglected by amateurs. More often than not trees are planted just as they are received from the nursery. Space will not permit me to go thoroughly into all the reasons for pruning a young tree at planting time, but it is a practice universally adopted by all orchardists, and is based upon sound reasons. The practice is to cut back to three or four main arms, care being taken that they do not all radiate from the same centre, but if possible at regular intervals. The reason for this is that there is not then the same liability to split in after years. The cuts should be clean, and to an outward bud, or in such a position that the subsequent growth will give a regular formation. The stronger the shoot the longer it should be left in comparison with its weaker brother; but, if possible, the topmost buds of the pruned limbs should be as nearly as possible on the same plane. One advantage of pruning after planting is that it is much easier to select buds to cut. The cut usually should be slanting, and close about the bud. This gives the most favorable condition for speedy healing, and it is well that wounds on fruit trees should heal as quickly as possible to prevent permanent injury and decay. Care should be taken that the cut is not too close, otherwise the shoot arising therefrom may split off and destroy the shape of the tree. Sometimes, with very upright growers, the cut is made 1in. or so above the bud; this has the effect of making the tree grow obliquely to the stem. It is a good plan to tie straw round the stem of a young tree to protect it from rabbits and hares, and also from the direct rays of the sun until protected by some of its own foliage.'' Mr. Fowler recommends the following varieties of trees:—Apples—For export—Cleopatra, Jonathan, Dunn's Seedling, Rome Beauty; for small gardens—Gravenstein or Irish Peach, Jonathan, Dunn's Seedling, Rome Beauty, Cleopatra, Nickajack, or Rokewood. Pears—Export—Glou Morceau, Burre Bose, Josephine, Winter Nelis; for small gardens—Duchess, Packham's Triumph, Vicar of Winkfield. Peaches—Triumph (Sea Eagle), Briggs' Red, Early Crawford, Lady Palmerston, Salwey. Nectarines—Goldmine, Stanwick. Apricots—Oullin's Early, Moor Park. Plums—Angelina Burdett (blue or black), Early Orleans (red or purple), Coe's Golden Drop and Green Gage (yellow and green). Drying Plums—Fellemberg Splendor, Prune D. Agen, Coe's Golden Drop. Canning—Coe's Golden Drop, Reine Claude de Bavay. Damsons—Shropshire, Vermont. Japanese Plums—Burbank, Wickson. Cherries—Early Lyons (black), Biggareau Napoleon (amber), St. Margaret's (purple to black). Figs—White Genoa, White Adriatic. Almonds—Hatch's Nonpareil, Ne Plus Ultra, Brandis. Oranges—Washington, Thompson's Improved. Lemons—Lisbon, Eureka. Quinces—Champion, Pineapple. Grape Vines—Black Hamburg, Wortley Hall, Red Prince, Red Malaga, Crystal, Early Green, Doradillo, Muscat, Gordo Blanco, Waltham Cross. Strawberries—Melba, Royal Sovereign, Gandy. After the address Mr. Fowler gave an interesting exhibition of the pruning of young trees on planting.

SANDALWOOD.

July 15th.—Present: 16 members and one visitor.

POULTRY.—In a paper on poultry, Mr. A. Grant advised selecting White Leg horns, which were good layers and very hardy. To improve the flock, a pen of from six to 10 second-year hens should be mated with a first-year cockerel from a hen with a big laying record. If the pullets were single tested and the prolific layers bred from in their second year, good results would follow. Neither small, over large, nor misshapen eggs should be set. Chickens hatched in August or September should commence laying at five months old, before the cold weather commenced and eggs were scarce. Wet or dry mash of bran and pollard and meat meal should be given to fowls the first thing in the morning, green feed at noon, and grain at night, and they should have access to shell grit, charcoal, and clean water. Turkeys were profitable, and when allowed to roam over a large area, gathered much natural food, and thus reduced the feed cost. They were excellent sitters and good mothers. Mr. Ritchie preferred feeding grain in the morning and at night a hot mash, in which a teaspoonful of mustard for every six fowls was mixed. Mr. Oakenshott preferred Silver Wyandottes to White Leghorns.

WIRREGA (Average annual rainfall, 19in. to 20in.).

May 13th.—Present: 11 members and one visitor.

PIGS ON THE FARM.—To raise a payable good type of pig the main factor was the selection of a boar, said Mr. W. R. Fairweather, in a paper dealing with the raising of pigs on a farm. In the selection of a boar, he declared, it was necessary to see the sire and dam, in order to determine whether he was suitable for the sows with which it was proposed to mate him. The boar should not be used for stud purposes until eight or nine months old, when he might be mated with a few sows, but the number should be limited until he was 18 months old. If used sparingly when young, the progeny would be stronger and better developed. The boar should not be permitted to get too fat or he might be rendered useless. The sows should be long, roomy, and deep, with broad loins and strong backs, qualities which afforded capacity for carrying big litters. The teats should be about 12 in number, even in conformation, and somewhat coarse. Some sows were fit to be used for breeding at the age of eight months, but others were better left until 10 or 12 months. If used too young, they produced either small litters or large litters of uneven, weakly pigs. When a sow had a small litter, say five, then five of her teats would be developed at the expense of the others. If the second litter were a large one, some of the young ones would be developed poorly and be of uneven growth, because some of the pigs would depend for their nourishment upon the badly developed teats. Breeding should be so arranged that the sows would farrow in the spring or summer months, because it was trying for the sow to raise a litter in cold weather. Sows should be given plenty of green feed and should be liberally fed, but not overfed, for by that means a whole litter might be killed. Badly fed sows produced inferior stock. After farrowing, the sow should not be disturbed for 10 or 12 hours, and then should be given a warm drink. When about one month old, the young pigs should be weaned, but it should be done gradually, in order that the growth might not be checked. It was a good plan to leave a couple of the young pigs with the sow to prevent the milk accumulating in the udder. Buyers preferred bacon pigs weighing from 150 to 160lbs. dead weight, which with good, well-regulated feed should be attained at the age of seven months. He deprecated heating or cooking grain food for pigs, because they ate it too quickly and did not digest it properly. The grain should be either soaked or crushed, preferably the latter. He preferred the Berkshire breed, which was hardy, a good grazer, and never suffered from sun scald, which was a serious defect in all white pigs. If the sow were of good type, her breeding was not material. Considering the price of pork in connection with the rates ruling for farm crops, especially oats, which did well in that district, it would pay to feed grain to pigs instead of marketing it.